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EIGHTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN,

FOR THE

FISCAL YEAR ENDING JUNE 30, 1890.



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Office of the Secretary of the State Board of Health,
LANSING, MICHIGAN, *December, 1890.*

To HON. CYRUS G. LUCE, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending June 30, 1890.

Very respectfully,

HENRY B. BAKER,

Secretary of the State Board of Health.

26712

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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REPORT.

This is the Eighteenth Annual Report of the Secretary of the Michigan State Board of Health, and is for the fiscal year ending June 30, 1890. It is arranged and paged in two parts. The first part contains the Secretary's report of the work of the Board, of the work in the Office of the Board, the annual report of property, including accessions to the library, with names of donors. The second part contains papers, abstracts, and reports—including one on the "Principal Meteorological Conditions in Michigan in 1889," one on "The Time of Greatest Prevalence of Each Disease," being a Study of the Causes of Sickness in Michigan, especially in 1889, and one on the dangerous "Communicable Diseases in Michigan in 1889"—relating to Diphtheria, Small-pox, Measles, Scarlet Fever, Typhoid Fever, Whooping-Cough, Pneumonia, Dysentery, Glanders, Rabies (hydrophobia), Actionomycosis (lump-jaw).

These several reports include the immensely extensive and valuable statistics on these subjects, collected at the office of the State Board of Health.

Under the law, the Secretary of the Board is required to disseminate information "through an Annual Report and otherwise," and, by direction of the Board, he issues immediately after the close of each week a bulletin which shows the sickness during the week just passed; also a monthly bulletin; and sometimes publishes quarterly proceedings of the work of the Board and the condition of health in Michigan during the quarter. The proceedings of sanitary conventions are published as soon as practicable after the occurrence of each convention.

Thus items of sanitary work in Michigan which are regarded as useful "news" are published at once in the comparatively ephemeral bulletins, etc., while the Annual Report is not issued, as a newspaper or journal is, as an ephemeral publication, but as a permanent official record of the work of the State Board of Health, and in the office of the Board, and of the local boards of health throughout the State. The Annual Report contains also statistics which require a great deal of painstaking care in their prepara-

tion, but which it is hoped will be useful, for all time to come, to those who study the causation of diseases; and through their labors, to the people of the State and country; and the statistics are there preserved in a permanent form, accessible, for purposes of study, to a comparatively large number of persons. However, only about six thousand copies of the Annual Report are printed, to supply the two millions and more inhabitants of Michigan; and only 3,500 of those copies are at the disposal of the State Board of Health. Of these, some are sent to libraries, some are sent in exchange for the publications of other State Boards of Health, of prominent city boards of health, of sanitary journals, etc.; others are sent to persons likely to make good use of them, including each of the fifteen hundred health officers in Michigan.

To this Report there are five Supplements, containing proceedings and addresses at the Sanitary Conventions held at Ludington, Pontiac, Vicksburg, Lapeer and Battle Creek.

The papers in the Supplements as well as those in this Annual Report, are printed subject to a resolution of the Board, printed on page ?.

The names and postoffice addresses of the members of the Board, and the dates of the expiration of their terms of office, are as follows:—

HENRY F. LYSTER, A. M., M. D., Detroit, Jan. 31, 1891.

JOHN H. KELLOGG, M. D., Battle Creek, Jan. 31, 1891.

JOHN AVERY, M. D., *President of the Board,* Greenville, Jan. 31, 1893.

ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1893.

VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1895.

DELOS FALL, M. S., Albion, Jan. 31, 1895.

HENRY B. BAKER, M. D., *Secretary of the Board,* Lansing.

The members of the State Board of Health, with the exception of the Secretary, are appointed for the term of six years, and receive no salary or *per diem* compensation for their services.

STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases.—H. F. Lyster, M. D.
2. Sewerage and Drainage.—H. F. Lyster, M. D.
3. Food, Drinks and Water-Supply.—V. C. Vaughan, M. D.
4. Buildings, including Ventilation, Heating, etc.—John Avery, M. D.
5. Climate, Geology, Topography, etc.—Henry B. Baker, M. D.
6. Disposal of Excreta.—John H. Kellogg, M. D.
7. Poisons, Explosives, etc.—V. C. Vaughan, M. D.
8. Occupations, Recreations and Habits.—J. H. Kellogg, M. D.
9. Relations of Schools to Health.—Delos Fall, M. S.
10. Sanitary Survey.—Delos Fall, M. S.

11. Vital Statistics.—Henry B. Baker, M. D.

12. Legislation.—John Avery, M. D.

13. Finances of the Board.—Arthur Hazlewood, M. D.

14. Mental Hygiene.—Arthur Hazlewood, M. D.

15. Animal's Diseases Dangerous to Man.—Henry B. Baker, M. D.

16. Relations of Preventable Sickness to Taxation.—J. H. Kellogg, M. D.

17. Plans for Model School Houses.—Hon. John Avery, M. D., J. H. Kellogg, M. D., and Arthur Hazlewood, M. D.

18. Alcoholic Liquors.—Henry F. Lyster, M. D., Victor C. Vaughan, M. D., and Arthur Hazlewood, M. D.

WORK OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1890.

Aside from the work in committees and in connection with the office of the Secretary of the Board, the work of the State Board of Health itself includes that done at the regular and special meetings of the Board, the holding of Sanitary Conventions, and the examination of plans for public buildings, under Sec. 7, Act 206, Laws of 1881, § 418 Howell's Statutes, amended by Act 86, Laws of 1889.

During the fiscal year 1890, the Board examined plans for three new buildings, one cottage and two infirmaries, at the Northern Asylum for the Insane, at Traverse City; for one cottage at the Asylum for Criminal Insane at Ionia; and two sets of plans for a new building at the State Reform School, at Lansing.

The Board held four regular meetings, and three special meetings, during the fiscal year, as follows: Ludington, July 12, 1889; Ionia, Sept. 24, 1889; Lansing, Oct. 8, 1889; Lansing, Jan. 14, 1890; Lansing (and State Reform School), March 13, 1890; Lansing (and State Reform School), April 15, 1890; and Battle Creek, June 25, 1890.

SANITARY CONVENTIONS.

Five successful sanitary conventions were held during the fiscal year ending June 30, 1890, as follows:

LUDINGTON SANITARY CONVENTION, JLLY 11 AND 12, 1889.

At the Sanitary Convention held at Ludington, the following program was carried out:

Address of Welcome, by Hon. H. A. Scott.
Response, by Prof. Delos Fall.
Progress in Sanitary Science and in Public Health Administration, by Judge J. B. McMahon.
The Hygiene of Schools, by Rev. J. W. McKeever.
Discussion, by Prof. Delos Fall.
The Present and Future Water-Supplies of Ludington, by W. H. Taylor, M. D.

The Sewerage and Drainage of Ludington, by John A. Mitchell, C. E.
Discussion, by A. Arnold Clark.
The Causation and Prevention of Consumption, by George Henry Cleveland, M. D.
Discussions, by Henry B. Baker, M. D., A. Arnold Clark, etc.
The Present and Future Methods of Disposal of Waste and Excreta in Ludington, by F. W. Graham M. D.
Discussion, by Arthur Haslewood, M. D.
Restriction and Prevention of Diphtheria, by G. W. Crosby. M. D.
Discussion, by Hon. John Avery, M. D.
The Duties of the Local Health Officer and the Relations of the People to the Local Health Officer, by James A. King, M. D.
Discussion, by Henry B. Baker, M. D.
Vote of Thanks, closing of the Convention, etc.

PONTIAC SANITARY CONVENTION, OCT. 17 AND 18, 1889.

At the Sanitary Convention held in Pontiac, the following program was carried out:

President's Address, by Hon. Byron G. Stout.
The Water Supply of Pontiac, by Aaron Perry.
Discussion of the Water Supply of Pontiac, by John H. Kellogg, M. D.
Disposal of Sewage and Waste in Pontiac, by E. C. Smith, C. E.
Statement concerning the Sewerage System in Connection with the Eastern Michigan Asylum, by C. B. Burr, M. D.
Discussion of Water Supply.
Discussion of the Sewerage of Pontiac, by H. F. Lyster, M. D.
The Prevention of Consumption, by A. Arnold Clark.
Address by Hon. Cyrus G. Luce, Governor of Michigan.
The Causation and Prevention of Insanity, by C. B. Burr, M. D.
Consumption, its Causation and Prevention, by Frank W. Brown, M. D.
Remarks by J. W. Seeley, M. D.
Remarks by A. Arnold Clark.
Remarks by Dr. Rhodes.
Remarks by Mason W. Gray, M. D.
Climate of Michigan, by Sergt. Norman B. Conger, Director of the Michigan Weather Service.
The Conservation of Water for Field Crops, by David G. Arnold.
Discussion of Meteorology and Disease, by A. Arnold Clark.
The Hygiene of School Buildings, by Prof. Hugh Brown.
Discussion of School Hygiene, by Prof. Victor C. Vaughan, M. D.
Discussion of Ventilation, by William E. Williams.
Discussion of Ventilation, by Rev. D. C. Jacokes, D. D.
Diphtheria, Scarlet Fever, and other Dangerous Communicable Diseases, by John S. Caulkins, M. D.
Discussion of Water Supply, by Prof. Victor C. Vaughan, M. D.
The Restriction of Communicable Diseases, by A. Arnold Clark.
Remarks, by I. M. Rhodes, M. D.
How Much Should Pontiac Pay its Health Officer? By Henry B. Baker, M. D.
Remarks by the President, Hon. Byron G. Stout.
Closing of the Convention.

VICKSBURG SANITARY CONVENTION, DEC. 5 AND 6, 1889.

At the Vicksburg Sanitary Convention, the following program was carried out:

Remarks by the President, Hon. James NeaSmith.
Sewerage and Drainage of Vicksburg, by C. H. McKain, M. D.
Discussion of Sewerage, by A. Arnold Clark.
Discussion of Sewerage, by Henry B. Baker, M. D.
School Hygiene, by George Newton, M. D.
Discussion of School Hygiene, by A. Arnold Clark.
Discussion of School Hygiene, by Prof. F. S. Dewey.
Germs, by A. Arnold Clark.
The Prevention of Consumption, and answers to Questions, by A. Arnold Clark.
Disposal of Excreta and Waste in Vicksburg, and the Relation of Privies and Cesspools to Wells, by W. W. Scott, D. D. S.

Discussion of the Subject of the Disposal of Excreta and Waste, by Prof. Delos Fall, M. S.
Discussion of the Subject, by Henry B. Baker, M. D.
Discussion of the Subject, by A. Arnold Clark.
Discussion of the Subject, by Victor C. Vaughan, M. D.
Ventilation, by Prof. F. S. Dewey.
The Water Supply of Vicksburg, by F. S. Collier, M. D.
Discussion of Water Supply, by Victor C. Vaughan, M. D.
Restriction and Prevention of the Dangerous Communicable Diseases, by Henry B. Baker, M. D.
Closing of the Convention, Resolutions, etc.

LAPEER SANITARY CONVENTION, MARCH 27 AND 28, 1890.

At the Lapeer Sanitary Convention, the following program was carried out:

Resolution, by State Board of Health, relative to Papers Published by it.
Introductory, Officers, Committees, etc.
Address of Welcome, by Mayor G. W. Carpenter.
Response to Address of Welcome, and Statement of the Objects of the Convention, by Hon. John Avery M. D.
The City Board of Health, by James W. Sherwood.
The Usefulness of a Board of Health, by Henry B. Baker, M. D.
Discussion, by Hon. John Avery, M. D., J. B. Sutton, Dr. Hugh McColl, Judge W. W. Stickney, Henry B. Baker, James Sherwood, Dr. W. D. Hathaway, and Judge J. B. Moore.
Relations of the Public Health to the Commonwealth, by Hon. R. L. Taylor.
Discussion, by Prof. A. Arnold Clark.
Discussion, by Henry F. Lyster, M. D.
Disease Ferments, by Prof. A. Arnold Clark.
Discussion of the Subject of School Hygiene, by Prof. C. E. Palmerlee.
School Hygiene, by Prof. Delos Fall, M. S.
The Use of Alcohol and Narcotics, Remarks, by Rev. J. P. Fryer.
A Study of the Action of Alcohol on the Human Body, by Prof. Delos Fall, M. S.
Remarks, by Henry F. Lyster, M. D.
The Public Press and the Public Health, by Jeremiah Lynch.
Discussion by Judge J. B. Moore, Henry B. Baker, M. D., Prof. Delos Fall, and Hon. R. L. Taylor.
Discussion of Action of Narcotics, by Prof. Delos Fall, M. S.
The Air We Breathe, and its Relations to Human Life and Health, by J. S. Caulkins, M. D.
Discussion of the Subject of Ventilation, by Henry B. Baker, M. D., Prof. Delos Fall, M. S., and Dr. J. S. Caulkins.
The Water Supply of Lapeer, by Hugh McColl, M. D.
Disposal of Waste and Excreta in Lapeer, by Hon. J. B. Moore.
Discussion, by Prof Delos Fall, M. S., and Hugh McColl, M. D.
Sewerage and Drainage of Lapeer, by W. J. Robinson, M. D.
Discussion, by George Arbury, Dr. J. S. Caulkins, and Henry B. Baker, M. D.
The Prevention of Communicable Diseases, by Hugh McColl, M. D.
Discussion of the Restriction and Prevention of the Dangerous Communicable Diseases.
Remarks by Henry B. Baker, M. D.
Remarks by A. Arnold Clark.
Resolutions, and Closing of the Convention.

BATTLE CREEK SANITARY CONVENTION, JUNE 25 AND 26, 1890.

At the Battle Creek Sanitary Convention, the following program was carried out:

Resolution, by State Board of Health, relative to papers published by it.
Introductory, Officers, Committees, etc.
Address of Welcome, by Hon. J. W. Bailey, Mayor of Battle Creek.
Response, and Statement of the Objects of the Convention, by Prof. Henry F. Lyster, M. D.
President's Address, by Judge Benjamin F. Graves.
The Restriction and Prevention of the Dangerous Communicable Diseases, by Henry B. Baker, M. D.
Discussion, by Prof. A. Arnold Clark.
The Commonwealth and the Common Health, by Hon. Cyrus G. Luce.
The Germ Theory of Disease and its Bearings on Modern Life, by John H. Kellogg, M. D.
Remarks by Judge Benjamin F. Graves.
Remarks by Prof. A. Arnold Clark.

The Best Methods of Sewerage in Battle Creek, by W. W. Brigden, C. E.
The Sewerage and Drainage of Battle Creek.
Discussion by Prof. A. Arnold Clark.
Discussion by Dr. John Avery, and Dr. J. H. Kellogg.
School Hygiene, by Mrs. Mary E. Green, M. D.
Discussion by Dr. J. H. Kellogg.
Ventilation of Residences and Public Buildings, by Hon. John Avery, M. D.
Resolutions Concerning School Hygiene; Remarks by Prof. A. Arnold Clark.
Habits in Relation to Health, by A. W. Alvord, M, D.
Present and Future Water Supply of Battle Creek, discussion led by Prof. Delos Fall, M. S., followed by Hon. C. E. Nichols, Henry B. Baker, M. D., Hon. Perry Mayo, and Drs. Alvord, Kellogg, and Metcalf.

EXAMINATION OF PLANS FOR STATE BUILDINGS, SEWERAGE, VENTILATION AND HEATING, DURING THE FISCAL YEAR ENDING JUNE 30, 1890.

Act No. 206, Laws of 1881 (§ 418, Howell's Annotated Statutes), as amended by Act No. 86, Laws of 1889, is as follows:

Plans for buildings, to whom submitted.

14. SEC. 7. That before the board of any charitable, penal or reformatory institution shall determine on the plan of any building, or on any system of sewerage, ventilation, or heating, which has been authorized by the legislature to be constructed, such plan shall be submitted to the board of corrections and charities and the State board of health for examination and opinion thereon; and the board so submitting such plan shall, in its biennial report, show to what extent it was approved by the boards so examining them. * * * That it shall be the duty of said State boards to visit said penal, charitable and reformatory institutions, when necessary to make the examinations herein required, and their official expenses necessarily incurred shall be audited by the board of State auditors and paid from the general fund.—§ 418.

The following are reports concerning plans for public buildings submitted to the State Board of Health for examination, during the fiscal year:

EXAMINATION OF PLANS AND SPECIFICATIONS OF PROPOSED BUILDINGS AT THE NORTHERN MICHIGAN ASYLUM FOR THE INSANE, AT TRAVERSE CITY, JULY 13, 1889.

A committee of the State Board of Health, consisting of Henry B. Baker, M. D., Lansing, Arthur Hazlewood, M. D., Grand Rapids, and Prof. Delos Fall, M. S., Albion, met in Traverse City, July 13, 1889, for the purpose of the examination of the plans and specifications of proposed new buildings at the Northern Michigan Asylum for Insane. The following is the committee's report:

Plans for a Cottage and two Infirmaries at the Northern Asylum for the Insane at Traverse City.

The undersigned, constituting a committee of the State Board of Health, appointed to examine the site, ground plans, and proposed ventilation, house-drainage and sewerage of a cottage for males, and of two infirmaries at the Northern Asylum for the Insane at Traverse City, Mich., respectfully report having visited the location and examined the site and plans, and listened to the explanations given by James D. Munson, M. D., Medical Superintendent of the Asylum.

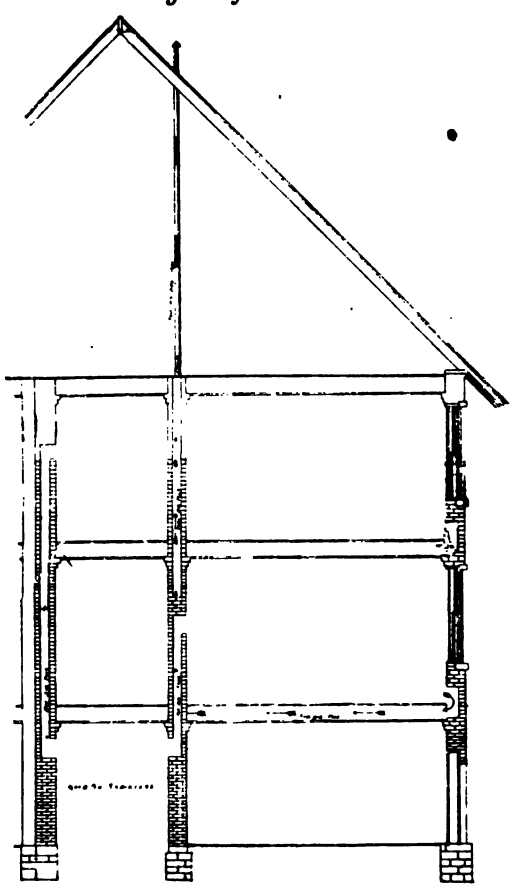
The cottage is to be near the cottage for which plans were examined by this Board last year, and which on our recent visit to it we found in excellent condition, and the ventilation of which was excellent, even though at *the time of our visit the* difference in temperature between the in-door air

and the out-door air was very little. The design is to have the ventilation of the proposed cottage similar to that of the one already built,—the rooms being warmed by indirect steam-heating. The foul air conduits will start from underneath windows, and from each room will be separate from those of any other room throughout to the outer air above the building. This was approved by the undersigned. It was suggested by us (and the suggestion was kindly received) that it is desirable to have provision for the ingress of fresh air from out of doors aside from that which passes over the heated radiators, and in such a way that when a room would otherwise be too warm, registers shall shut out some of the heated air and admit cold air to mingle with that which has been heated, and thus lower the temperature without shutting off any of the needed supply of fresh air.

The sites and plans for the house-drainage and sewerage for the three buildings are approved.

HENRY B. BAKER,
ARTHUR HAZLEWOOD,
DELOS FALL,
Committee.

Method of Heating and Ventilating Cottage and Infirmaries at Northern Asylum for Insane.



Specifications for a Cottage and two Infirmaries at the Northern Michigan Asylum for the Insane.

NORTHERN MICHIGAN ASYLUM,
TRAVERSE CITY, MICH.,
September 6, 1889.

HENRY B. BAKER, M. D.,
Secretary of State Board of Health.

DEAR DOCTOR:—As requested by the committee appointed by your Board to inspect the plans, etc., for our new buildings, I have the honor of submitting the following description of them. These buildings, which are all plain but substantial structures, consist of, first, a cottage for fifty male patients, estimated cost $15,000; second, an infirmary for thirty male patients, and, third, an infirmary for thirty female patients, estimated cost $30,000.

THE SITES AND DIMENSIONS.

The cottage is located a few hundred feet south of the present cottage for males. It affords a very pleasant outlook, and a sufficient elevation for perfect drainage. It is a brick and stone structure nearly square in outline, 78 feet long and 44 feet wide, and is a basement (eight feet) and two stories (ten feet six inches) in height. In its general arrangements—plumbing, heating and ventilation—it so closely duplicates the cottage built here last year that it is not deemed necessary to enter into a detailed description of it at this time.

The infirmaries are located in the rear of the main building, and are connected to the middle division of each wing, respectively, by covered corridors 60 and 85 feet in length and 13 feet in width, the south corridor being the shorter one. The infirmaries are in extreme length 102 feet, in greatest breadth 52 feet, and each floor has about 4,500 square feet. Each faces to the southeast, and are a basement (eight feet), two stories (twelve feet) and an attic in height. The roofs are covered with slate. In the construction of the infirmaries field stone of medium size were used for the basements to the grade or water table line; the superstructures are of brick. The outside walls are fourteen inches thick, and laid with a two-inch air space. The inside walls are from eight to sixteen inches in thickness, and contain the thermal and ventilation flues. The basement story contains only the heating apparatus. The first story consists of nine single rooms for patients, attendant's room, dining room, kitchen, clothes room, bath room, two water closets, a boot cupboard, a clothes press and a hall. A characteristic feature of the infirmaries is the arrangement of rooms for the care of contagious and infectious cases. These, two in number on each floor, are isolated from the main halls, and have a special water closet, clothes press and clothes shaft. Patients may be cared for in these rooms without the necessity of contact with others, and fresh clothing can be furnished them, and soiled bedding and garments removed without danger of spreading infection. Especial pains have been taken with their warming and ventilation.

There is but one dining room in each infirmary, and in connection with it is a small kitchen, in which it is designed to prepare food for the sick and feeble, and thus secure to them more comforts and homelike attention than is now possible. A pleasant feature of the interior is the spacious hall, which extends the length of the infirmary. Near its center is a large alcove, which opens on a piazza to the front of the building, and to the west it widens into a bay, which affords an especially pleasant sitting room. The second stories have the same general arrangement of rooms, with the exception that over the dining rooms and kitchens there are dormitories. A part of the attics are furnished into sleeping apartments for the use of night attendants. The stairways are closed at both the bottom and top, to obviate currents of air from one story to another.

HEATING.

The cottage is heated by a low pressure steam heating apparatus, and the infirmaries are to be heated by steam, after the addition of a boiler to the present plant. The "Gold" pin indirect radiators are used, and are set up in the basements. Flues constructed in the walls, beginning at the radiators, supply pure warm air to all parts of the buildings. In order to insure an equitable distribution of warm air the openings of these flues are placed about seven feet above the floor. There is in each alcove an open fire place.

VENTILATION.

Foul air outlets are provided for every room, and those in the dining and sitting rooms are of greater area than in sleeping apartments. These outlets commence under the windows, or, where this is not practicable, in the outside wall at the floor level, pass in flues between the floor joist to an inside wall, and thence to the open air above the roofs. The foul air outlets in the kitchens are near the ceiling, and in

water closets on the floor near the hoppers. The total area of foul air outlets is forty-eight square feet for each infirmary, which considerably exceeds that of the fresh air inlets. The system of ventilation is the same as that used in the cottage built last year, and which has been examined and found satisfactory by your board.

PLUMBING.

The plumbing fixtures are of the most recent kind. Automatic flushing stools and urinals, enameled sectional slabs and bowls and slop sinks, and cast iron bath tubs are used. All waste pipes from these fixtures are trapped, and each trap and pipe is separately ventilated to the open air. All waste pipes connect with sewer in pipe shaft. The latter is built in an angle from outside walls, which obviates the necessity for running the sewers under any part of the building. The sewer connects with the asylum system. At the point where it enters the pipe shaft it communicates with the open air above roof through a four-inch cast iron pipe. The first few feet of the sewer is of six-inch cast iron pipe, the remainder of glazed pipe, laid water tight. All the new buildings are supplied with water from the asylum well, and lighted by electricity from the asylum plant. The laundry work will be done at the main building.

All side walls are plastered on the brick, and ceilings on lath. The floors are laid double with, a deafening coat of mortar between the furring.

The accompanying drawing * will illustrate the methods of heating and ventilating any given section of these buildings.

Yours respectfully,

Lansing, Michigan. JAMES D. MUNSON,
Medical Supt.

EXAMINATION OF PLANS OF A PROPOSED COTTAGE AT THE ASYLUM FOR INSANE CRIMINALS, AT IONIA.

[At the time of printing of this volume, the official report of this examination cannot be found; the following, however, is believed to be the substance of it.]

At the special meeting of the State Board of Health at the Asylum in Ionia, Sept. 24, 1889, the members present were John Avery, M. D., President; Arthur Hazlewood, M. D., John H. Kellogg, M. D., and Henry B. Baker, M. D.

The Architect, Claire Allen, of Lansing, Michigan, was introduced to the Board by O. R. Long, M. D., Supt. of the Asylum. The plans of the proposed cottage were presented to the Board for consideration, and were generally approved, except that the provision that the foul air should be carried between the joists under the floors to a common duct, was not approved. The State Board of Health recommended that the ventilation should be from the floor level, and be separate and distinct from each room to the outer air; that the ducts from the several rooms go up through partitions to the attic, and discharge through several ducts through the roof, which ducts might there be grouped, if desired, but should be kept separate each from the other.

[A subsequent letter from O. R. Long, M. D., says "Your suggestions were carried out."]

REPORT OF EXAMINATION OF PLANS FOR PROPOSED NEW BUILDING AT THE MICHIGAN STATE REFORM SCHOOL.

[Transmitted by the Secretary of the State Board of Health, to the Board of Control of the Michigan State Reform School, March 18, 1890.]

Notice was received by the Secretary of the State Board of Health from Hon. C. A. Gower, Supt. of the Reform School, as follows:

Lansing, Mich., Feb. 20, 1890.

"DEAR SIR—I am directed by the Board of Control of the Reform School to inform your Board that

* The diagram exhibiting the "Method of Heating and Ventilating Cottage and Infirmaries at Northern Asylum for Insane" is printed on page xiii.

plans and specifications for the proposed new building on the Reform School grounds are prepared and can be seen at the institution. This action by our Board is in obedience to provision of Sec. 418, Howell's Comp.

"Very truly,

"C. A. GOWER, *Supt.*"

Accordingly, a special meeting of the State Board of Health was called by the President, and held at the State Reform School, March 13, 1890. After the meeting at the Reform School, the Board adjourned to meet at the Capitol, where the Secretary was directed to write out in full the minutes taken during the examination, and transmit the report to the Board of Control of the State Reform School.

This Board viewed the site of the proposed new building, to which no objection was mentioned.

The plans submitted to the State Board of Health showed water-closets, and one seat in each of the dormitories, but did not show such details of the plumbing, soil-pipes, and house drainage as would warrant the expression of any opinion as to their sanitary or unsanitary character. Practically, no plans for such appliances have yet been submitted to us.

The method of heating, specified in the plans and specifications, submitted to us, was by steam, by the "Direct," "Direct-indirect," and the direct and indirect systems combined. No room was planned to be warmed entirely and only by the "Indirect" system.

This Board objects to the "Direct" system in this building, more especially in the school rooms, and recommends that the object sought by having the steam pipes on the walls under the windows, be accomplished by having the foul-air registers placed at the floor level under the windows, ducts leading therefrom to the foul-air shafts in the inside wall. Such placing of the foul-air registers would do good at all times of ordinary cold weather by preventing the cold air, which falls down the windows, from being carried over the floor and across the feet of occupants, as it would be if the registers were not so placed. As the proposed steam pipes in the rooms are not to be heated (so we were informed) except in extreme cold weather, that can better be provided for by placing the extra-heating surface in the basement in "Indirect" radiators or coils to be used only in case of need.

In the plans, the registers for the inlet of fresh air are placed in the floor. This is objectionable, because of the registers and pipes beneath collecting dust and dirt when air is not coming in, which, when air does come in rapidly will be carried up and must then be inhaled by the occupants of the room. Under some circumstances the inhalation of dust from some sources might be not merely disagreeable but dangerous to life and health.

The plans seem to show no ventilation whatever for the rooms marked as follows:

"Stenographer's room," "water-closets," "bath room," "clothing room," "boys' waiting room," "parlor," "closets," "main hall," "middle hall," "wing hall." This Board does not approve of this.

The plan shows the heating of the dining-room to be by the "Direct-indirect" system. This we consider insufficient; the dining-room should be warmed and ventilated, by the "Indirect" system of heating.

The sizes of ventilating shafts were not specified, but they were considered by this Board to be not sufficient, and not numerous enough to provide, as they should, for ventilating each side of the building, and room on each floor, into separate shafts.

For the best ventilation it is requisite to have a separate and independent foul-air conduit from each room to the outer air above.

It may be said that, in general, the plans submitted for the heating and ventilating of this proposed building are not approved by this Board, the provision for the admission of fresh air and the removal of foul air being inadequate. There does not appear to be, as there should be, provision for the admission of fresh cool air that shall not have passed over steam-pipes, but which shall be mingled with the air that has been so heated before it passes into the occupied room. Without this provision a room warmed by the "indirect" system has no fresh air supply whenever the inlet register is closed, there being no way to stop out the heat except to stop the air supply. This may be easily remedied, but the plans show no attempt in that direction.

The plans show the "Clothing-room" (in which it is supposed is to be stored clothing for the inmates) to be in direct communication with the water-closet and bath room through which and into which inmates are ushered on their first arrival, to be purified by bathing, and clean clothing. This Board recommends that there be no such direct communication making it necessary that every newly-arrived boy be taken through the clothing-room before his bath and purification, as it might thus be possible at some time to spread a dangerous communicable disease.

All of which is respectfully submitted. By direction of the State Board of Health.

Very respectfully,
HENRY B. BAKER, *Secretary.*

REPORT OF EXAMINATION OF A SECOND SET OF PLANS FOR A PROPOSED NEW BUILDING AT THE MICHIGAN STATE REFORM SCHOOL.

[Transmitted by the Secretary of the State Board of Health, to the Board of Control of the Michigan State Reform School, April 16, 1890.]

Notice was received by the Secretary of the State Board of Health from Hon. C. A. Gower, Supt. of the Reform School, as follows:

"STATE REFORM SCHOOL,
LANSING, MICH.,
April 8, 1890.

DR. HENRY B. BAKER, *Sec'y State Board Health, Lansing, Mich.:*

DEAR SIR—We now have another set of plans, for heating and ventilating our new building, which we shall be pleased to have your Board consider, if it so desires. The entire plans of the building are also now in our possession.

Very truly,
C. A. GOWER, *Supt.*"

Accordingly, a meeting of the State Board of Health was called and held at the State Capitol, April 15, 1890, the plans having previously been examined by a committee of the State Board of Health—Drs. J. H. Kellogg, and H. B. Baker, at the State Reform School. Hon. William Donovan, of that Board, and Hon. C. A. Gower, Supt., being present. The Secretary was directed to write out in full the minutes taken during the examination by this Board, and transmit the report to the Board of Control of the State Reform School.

The sewer under the center of the building is specified to be "under the surface of cellar bottom." If it were placed in a cemented trough or conduit it would facilitate access to it, in case of need, and in case of a break, it might tend to lessen the nuisance.

The plans submitted to the State Board of Health showed water-closets, and one seat in each of the dormitories, but did not show such details of the plumbing, soil-pipes, and house drainage as would warrant the expression of any opinion as to their sanitary or unsanitary character. Practically, no plans for such appliances have yet been submitted to us. There should be a foul-air register under the window nearest the closet seat or hopper in the corner of each dormitory.

The method of heating, specified in the plans and specifications, submitted to us, was by steam, by the "Direct," and by the direct and indirect systems combined. No room was planned to be warmed entirely and only by the "Indirect" system.

The Board objects to the "Direct" system in this building, more especially in the school rooms; and recommends that the object sought by having the steam pipes on the walls under the windows, be accomplished by having the foul-air registers placed at the *floor level* under the windows, ducts leading therefrom under the floor to the foul-air shafts in the inside wall. Such placing of the foul-air registers would do good at all times of ordinary cold weather by preventing the cold air, which falls down the windows, from being carried over the floor and across the feet of occupants, as it would be if the registers were not so placed. If this is adopted, probably it will do away with the necessity for the "direct" pipes on the wall. (The steam pipe may be capped, and the pipes on the wall added, if found necessary, at any future time.) As the proposed steam pipes in the rooms are not to be heated (so we were informed) except in extreme cold weather, that can better be provided for by placing the extra heating surface in the basement in "Indirect" radiators or coils to be used only in case of need.

Under no circumstance should air for occupied rooms be taken from the basement.

It is suggested that the registers be "face-plates"—without valves, so that they would not carelessly become closed, and remain closed.

In these plans, the registers for the inlet of fresh air are placed six feet above the floor. This is a very desirable modification. (In the plans previously submitted the inlet registers were in the floor.)

The foul-air registers are specified to be above the base board. They should be at the floor level and wherever practicable, under the windows.

The plans seem to show no ventilation whatever for the rooms marked as follows:

"Stenographer's room," "water-closets," "bath-room," "clothing room," "boys' waiting room," "parlor," "closets," "middle hall," "wing hall." This Board does not approve of this. The fire-place in "Main Hall" might well be made a fresh-air inlet of size sufficient to supply all the rooms adjacent, and each of said rooms should have a foul-air outlet, under a window if practicable. Transoms might be provided so that the fresh air brought into the main hall could reach the adjacent rooms. Such provision is especially desirable for the several water-closets, so that the current of air shall be toward the closet, instead of from the water-closet toward the fireplace in the main hall now shown on the plan.

The plan shows the heating of the dining room to be by the "Direct"

system. This we consider insufficient; the dining room should be warmed and ventilated by the "indirect" system of heating.

The ventilation of the basement water-closets is *not definitely shown.* The main return pipe is specified "below the basement floor" and in a "pine box" "filled with charcoal." The plans show it near the center of the play room in the basement. If the pipe were placed on the west wall, above the floor, it would be more accessible and less liable under some circumstances to prove an annoyance, as it might if organic fluids should saturate the heated box.

For the best ventilation it is requisite to have a separate and independent foul-air conduit from each room to the outer air above.

It may be said that, in general, the plans submitted for the heating and ventilating of this proposed building are not approved by this Board, the provision for the admission of fresh air and the removal of foul air being inadequate. For some of the rooms there now appears to be, as there should be, provision, by what is called a "mixing damper," for the admission of fresh cool air, that shall not have passed through steam coils or radiators, but which shall be mingled with the air that has been so heated before it passes into the occupied room. This has the approval of this Board.

The plans show the "Clothing room" (in which it is supposed is to be stored clothing for the inmates) to be in direct communication with the water-closet and bath room through which and into which inmates are ushered on their first arrival, to be purified by bathing, and clean clothing. This Board recommends that there be no such direct communication making it necessary that every newly-arrived boy be taken through the clothing room before his bath and purification, as it might thus be possible at some time to spread a dangerous communicable disease.

All of which is respectfully submitted. By direction of the State Board of Health.

Very respectfully,
HENRY B. BAKER, *Secretary.*

ABSTRACTS OF QUARTERLY REPORTS BY THE SECRETARY, OF WORK DONE IN THE OFFICE OF THE STATE BOARD OF HEALTH, DURING THE FISCAL YEAR ENDING JUNE 30, 1890.

REPORT FOR SIX MONTHS ENDING OCT. 8, 1889.

During the six months, the office has received information of and taken action relative to 92 outbreaks of diphtheria, 74 outbreaks of typhoid fever, and 108 outbreaks of scarlet fever. The usual numbers of documents on the restriction of these diseases have been sent to the localities where these diseases prevailed.

The proceedings of the Sanitary Convention at Hastings have been printed. Successful conventions have been held at Otsego, Tecumseh and Ludington. The proceedings of the Conventions at Otsego and Tecumseh have been edited and printed, and the proceedings of the Ludington Convention are now in the hands of the State printer. [Now printed.] Arrangements have been made for sanitary conventions at Pontiac and Vicksburg, and the announcements for these conventions have been sent out. The

usual distribution has been made of the printed proceedings of the Conventions which have been held.

The Annual Report of the Board for 1888 has been sent to the health officers of cities, villages and townships, the clerks and presidents of villages, clerks and mayors of cities, to sanitarians in other States, and to lists of names supplied by the members of this Board, in all about 3,200 copies.

A second demand has been made on clerks of delinquent cities, villages and townships, for a return of the name and address of the health officer. There have been received, filed and entered in the books the names of health officers of 49 cities, 265 villages, and 1,033 townships. Documents explanatory of the proper work of health officers and of local boards of health have been sent to each health officer whose name has been returned, also to the clerk or supervisor making the return. A list containing the names and addresses of the health officers has been printed and a copy sent to every city, village and township; those sent to localities from which no return was received were marked to show the delinquency.

The article on meteorology for the Annual Report for 1889 has been printed, also a part of the article on the Causation of Disease. The rest of this article is ready to be printed. The articles on the Communicable Diseases, and on Nuisances for the report for 1889 are also ready to be printed. The first part of the Report (which is always printed last) is nearly ready for printing.

A summary of meteorological conditions at this office for each month has been sent regularly to the Chief Signal Officer at Washington, and a summary of each week has been used, in connection with weekly reports of diseases in Michigan, for the weekly and monthly bulletins of health in Michigan.

Since April 13, there have been received and entered in the library of the Board, 273 books and pamphlets—mostly in exchange for publications issued by this Board.

Forty-three volumes of periodicals have been sent to the bindery, and 123 incomplete volumes have been arranged for completing and binding.

During the six months, forty diagrams have been made, including fifteen for the article on meteorology, and five for the article on sickness in Michigan, photo-engraved for the Report for 1889.

Monthly meteorological registers for the year 1889 have been received from twenty-two stations in Michigan for nearly each month, and examined to and including August. Quite a large amount of work on the compilation for the meteorology for 1889 has been done.

During the last six months 2,819 pages of hektograph work have been executed, among which were:—

1.—A copy of a report, by Dr. Avery, on the epidemic of typhoid fever at Negaunee.

2.—"Every case of typhoid fever should be reported to the health officer;" and

3.—"A new Law."

The hektograph letter, entitled "A New Law," together with other publications bearing on the necessity of reporting typhoid fever to the health officer, was sent to 575 editors in Michigan. This hektograph letter has been considerably quoted. In some instances it has been printed in full.

July 1, an invoice was made of all property on hand, used, and expended during the fiscal year ending June 30, 1889.

A proposed circular has been prepared, containing a list of all the publi-

cations of the Board which may be had on application to the office and the payment of postage, the amount of postage being stated for each publication.

Since last report, the Secretary, by authority of the Board, attended the meeting of the State Business Men's Association, and read a paper on the "Adulteration of Foods" before that Association.

The Board has held two meetings, one at Ludington at the time of the Sanitary Convention, one at Ionia to examine plans for a proposed cottage in connection with the Asylum for Insane Convicts.

A committee of the Board consisting of Prof. Delos Fall and Drs. Hazlewood and Baker, visited the Northern Asylum for the Insane at Traverse City to examine the site and plans for a proposed cottage and for two infirmaries, in connection with that institution.

[Reports of examination of State buildings are printed on pages xii–xix of this Report.]

ABSTRACT OF THE SECRETARY'S QUARTERLY REPORT OF WORK IN THE OFFICE OF THE BOARD DURING THE QUARTER ENDING JANUARY 14, 1890.

During the quarter the office has received information of and taken action concerning 118 outbreaks of diphtheria, 122 outbreaks of scarlet fever, 155 outbreaks of typhoid and typho-malarial fever, and two outbreaks of small-pox.

About twice as many pamphlets as are usually sent out during a quarter have been sent to those localities where diphtheria, scarlet fever and typhoid fever prevailed, bearing on the restriction and prevention of these diseases.

During the quarter 52 volumes and pamphlets have been received and entered in the library of the Board, of which 5 were by purchase, and 47 were by gift or exchange.

During the quarter there have been executed 1,197 pages of hektograph work. Among these was a paper by the Secretary, entitled: "One Cause of Sickness and Discomfort largely preventable,"* which was sent to about two hundred newspapers. The object of this paper was to dissuade the inhabitants of villages and small cities from burning leaves and other rubbish at a time when the smoke was likely to settle and cause discomfort. Another short article entitled "One way to propagate typhoid fever" and showing how that disease occurred in Plymouth, Michigan, was largely distributed. A hektograph notice was sent to the health officers of the principal cities in Michigan, and to a few newspapers, entitled: "Look out for typhus fever," and giving warning that six typhus fever patients, immigrants from Europe through New York City were distributed throughout the country, and urging health officers to be alert and report promptly any suspected cases.

The abstract of proceedings of the Board at its last meeting have been sent to the health officers of cities, villages, townships, and other sanitarians—1,650 in all.

About 1,200 copies of the proceedings of the Sanitary Convention at Ludington have been distributed.

There have been sent to about 1,400 ministers in Michigan a paper by Rev. Adkins before the Sanitary Convention at Tecumseh, with diagrams showing the saving of life from scarlet fever and diphtheria.

* The paper, "Sickness Caused by Smoke in the Air," is printed in this Report.

Blanks and circular letters asking for an annual report have been sent to every health officer in the State, also to the clerk of every local board of health; there have been received at this date 347 reports of health officers and 278 reports of clerks.

During the quarter successful sanitary conventions have been held at Pontiac and Vicksburg. The proceedings of the Pontiac convention are now being printed.

The public health laws with amendments to laws, passed since 1883, have been compiled and sent to the State Printer.

The part of the Annual Report for 1889, not yet printed, is now ready for print.

A monthly summary of meteorological conditions at this station has been regularly sent to the chief signal officer at Washington, a briefer one supplied to the director of the Michigan Weather Service, and a summary for each week has been used in connection with the weekly reports of diseases in Michigan.

Blank meteorological registers, stamped envelopes, etc., have been sent to meteorological observers for their use during the year 1890.

Meteorological registers for 23 stations in Michigan for each month in 1889 have been received and examined. Computations for ten months from four stations have been made and comparisons of these computations with observations made twice a day, viz., 7 A. M. and 7 P. M., have been made.

During the quarter four diagrams have been made and photo-engraved.

ABSTRACT OF THE SECRETARY'S REPORT FOR THE QUARTER ENDING APRIL 10, 1890.

During the quarter the office has received information of and taken action relative to 145 outbreaks of diphtheria, 166 outbreaks of scarlet fever, 78 outbreaks of typhoid fever, and 114 outbreaks of measles.* The usual number of documents on the restriction of these diseases (except measles) have been sent to the localities where these diseases prevailed. No case of small-pox has been reported during the quarter.

A circular letter and blank for the annual return of the name and address of health officer have been sent during the quarter to the supervisors of townships, the clerks of villages and cities and to the presidents of villages and the mayors of cities.

During the quarter 103 books and pamphlets have been received and entered in the library of this Board, mostly in exchange for the publications of this Board.

During the quarter ending April 10, 1890, there have been received annual reports from 717 health officers and 688 clerks of townships, cities and villages, making a total of 1,405 annual reports received, as against a total of 1,207 received during the corresponding quarter of 1889, and 864 for the corresponding quarter of 1888.

All the cases and deaths from diphtheria, scarlet fever, typhoid fever and measles mentioned in these reports have been compiled. All the letters and reports received concerning the dangerous communicable diseases in Michigan in 1889 have been assorted, and the compilation of the same has been begun.

* Record of measles was not begun until the middle of the quarter.

Three hundred and twenty-two blanks giving names of medical practitioners have been received, arranged and filed.

During the quarter a successful sanitary convention was held at Lapeer, and an invitation has been received for a convention at Charlevoix during the coming summer. Steps have also been taken at Battle Creek for a sanitary convention in that city.

During the quarter, 1,800 pages of hektograph work have been executed.

The proceedings of the sanitary conventions at Pontiac and Vicksburg have been edited, printed, and sent to those who took part in the conventions, to libraries (80 in all), to the secretaries of State medical societies, to secretaries of State boards of health, to sanitary journals and exchanges, health officers of cities and villages in Michigan, the health officers of other States, and to the correspondents of this Board. A list of the publications of the Board which may be had, on payment of postage, was sent to the health officers of townships, cities and villages. In response to requests (in answer to this list) a large number of reports, supplements and reprints have been sent out.

A monthly summary of meteorological conditions at this station has been regularly sent to the chief signal officer at Washington, a briefer one supplied to the Director of the Michigan Weather Service.

The computations of meteorological registers for 23 stations in Michigan during the year 1889 have been made.

The regular weekly and monthly bulletins of health in Michigan have been issued, and work has been begun on the compilation of the weekly reports of diseases for 1889.

Twenty diagrams have been made during the quarter in ketograph ink, for facilitating studies of the relations of certain meteorological conditions to diseases, and two of these diagrams have been photo-engraved.

Seventeen hundred and sixty-two newspapers have been looked over since Feb. 14 for reports of communicable diseases. This has resulted in giving this office information of the occurrence of 22 outbreaks of diphtheria, 24 outbreaks of scarlet fever, 15 outbreaks of typhoid fever, and 61 outbreaks of measles, during the time between Feb. 14–Mar. 31, 1890.

TABLE 4.—*Showing the number of outbreaks of Diphtheria, Scarlet fever, Typhoid fever and Measles from February 14, to March 31, 1890, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent from which no reply was received from the health officer.*

Diseases.	Reports from *all* sources. Feb. 14–March 31, 1890.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria	69	32	36	27	36
Scarlet fever	92	26	21	29	50
Typhoid fever	27	56	27	33	40
Measles	114	54	64	5	30
Averages for the four diseases		42	37	24	39

MEETINGS OF STATE BOARD OF HEALTH, FISCAL YEAR ENDING JUNE 30, 1890. ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS.

ADJOURNED REGULAR MEETING AT LUDINGTON, JULY 12, 1889.

The meeting was called to order by the President at 9 A. M. The following members were present: Hon. John Avery, M. D., President, Greenville; Arthur Hazlewood, M. D., Grand Rapids; Prof. Delos Fall, M S., Albion, and Dr. Henry B. Baker, Secretary, Lansing.

It was thought that the plans and specifications for the cottage for males at the Northern Asylum for the Insane were to be presented for examination; but, as the plans and specifications were not in the hands of the Board, the examination could not be made.

The regular business of auditing of bills and accounts was transacted, after which the Board adjourned.

A committee, consisting of Drs. Baker and Hazlewood and Prof. Fall, was appointed to meet in Traverse City, July 13, 1889, for the purpose of the examination of the sites and plans for proposed new buildings, and a telegram was sent to Dr. J. D. Munson giving him the action of the Board. [Report of the examination of the plans is printed in this Report, pages xii–xv.]

ABSTRACT OF PROCEEDINGS OF THE SPECIAL MEETING HELD AT IONIA, SEPT. 24, 1889.

For this meeting, a call by the order of the President of this Board was sent to each member, to meet at noon, Sept. 24, at Ionia. In the call, the purpose of the meeting was not limited to the examination of plans for the proposed cottage for insane criminals. The Board met in the office of O. R. Long, M. D., Supt. of the Asylum for Insane Criminals.

About noon the Board was called to order by the President—Dr. John Avery. A quorum was present, consisting of the following named members: John Avery, M. D., President, Arthur Hazlewood, M. D., John H. Kellogg, M. D., and Henry B. Baker, M. D., Secretary.

The architect, Claire Allen, of Lansing, was introduced to the members of the Board by O. R. Long, M. D., Supt. of the Asylum. The plans of the proposed cottage were presented to the Board for consideration, and were generally approved, except that the provision that the foul air should be carried between the joists under the floors to a common duct, was not approved. The State Board of Health recommended that the ventilation should be from the floor level, and be separate and distinct from each room to the outer air; that the ducts from the several rooms go up through partitions to the attic, and discharge through several ducts through the roof, which ducts might there be grouped, if desired, but should be kept separate each from the other. The Secretary was appointed a committee to consult with the architect, Mr. Allen, with reference to the recommendations of the Board.

Business was transacted, and bills and accounts were audited. Twelve vouchers, being State Board of Health Nos. 1793 to 1804, inclusive, were allowed.

The Secretary presented communications from J. S. Flanders, Secretary of the "Diffusible Tonic Co." of Sturgis, Michigan, setting forth the virtues of "Flanders' Diffusible Tonic," for the cure of typhoid fever, especially with reference to the outbreak at Negaunee, Mich., and asking that members of this Board investigate the remedy. One of the letters mentioned the transmittal of bottles of the remedy to the Secretary of this Board to be presented to the members for their investigation. The Secretary said that he had replied that this Board dealt with the prevention and not with the cure of disease; and that Mr. Flanders had responded that the cure of a first case was an important item in the prevention and spread of the disease.

Transportation of Dead Bodies.

The Secretary presented the preamble, resolutions and "Rules for Transportation of Dead Bodies, as adopted by the National Association of General Baggage Agents," at their meeting in Detroit, Aug. 1889, and which it is proposed by them to put in force throughout this country "on and after December 1st, 1889, or so soon thereafter by each line as may be." (Two enclosures accompanied the above—blank "Certificates of Undertaker" and blank "Transit Permit" with stub, both numbered "8950;" also a letter signed by the several General Baggage Agents of roads in Michigan.)

On motion of Dr. Kellogg the "Rules" were approved, subject, however, to the law in Michigan which in §1636 Howell's Statutes, provides that any local Board of Health" shall also make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from their township [city or village, as the case may be*], or into, or from any vessel; and if any person shall violate any such regulation, he shall forfeit a sum not exceeding one hundred dollars."

The Secretary was instructed to communicate to the Sec. of the National Assoc. of General Baggage Agents, this action, by this Board, and the above—quoted law bearing upon this subject.

The Secretary presented a communication from James D. Munson, M. D., Med. Supt. Northern Asylum for the Insane, setting forth the descriptions of the proposed new cottage and the two infirmaries at that Asylum, also a drawing "Illustrating the heating and ventilating of any given section of these buildings."

REGULAR QUARTERLY MEETING, OCT. 8, 1889.

[151.]

The regular meeting of the Michigan State Board of Health was held in the State Capitol in Lansing, Oct. 8, 1889. The members present were as follows: Hon. John Avery, M. D., President; Arthur Hazlewood, M. D., Prof. Delos Fall, and Henry B. Baker, M. D., Secretary.

The minutes of the special meeting at Ionia, Sept. 24, 1889, were presented, read by the Secretary, and approved.

CASES OF TYPHO-MALARIAL FEVER SHOULD BE REPORTED.

The Secretary of the Board mentioned outbreaks of fever in Michigan which were called "typho-malarial" in which there were deaths. In some

*§1681, Howell's Statutes.

instances it was thought that cases of typhoid fever were called typho-malarial to evade the law requiring cases of typhoid fever to be reported to the health officer and precautions to be taken.

[The subject was thoroughly discussed, preambles and resolutions were adopted. The substance of the action is recorded on pages 236-9 of this Report.]

AN ALLEGED REMEDY FOR FEVERS.

The Secretary presented letters and circulars concerning "Dr. D. L. I. Flanders' Diffusible Tonic, a new corporal disinfectant for the Prevention and Treatment of all fevers caused by infection, pyæmia or malaria," and stated that the proprietors of the remedy desired the Board to make thorough tests of the Tonic. The Secretary had replied that this Board dealt with the prevention and not with the cure of diseases; and the proprietor of the remedy had responded that the cure of the first case of typhoid fever was an important measure for the prevention of subsequent cases. The Secretary had then sent a bottle to Prof. Vaughan, of the University, for analysis and examination. The following letter gives the result of the analysis:

CHEMICAL LABORATORY, UNIVERSITY OF MICHIGAN,
October 2, 1889.

Michigan State Board of Health:

GENTLEMEN—I received from Dr. Vaughan an unbroken package, containing a bottle of Diffusible Tonic, which I analyzed with the following results:

Sulphate of the Cinchona alkaloids	2 per cent.
Ext. of Hydrastis, about	0.6 "
Alcohol	25. "
Water to make	100 "

Respectfully yours,

A. B. STEVENS.

The Secretary presented his Report of Work in the Office during the six months ending Oct. 8, 1889 [An abstract of it is printed in this report, on pages xix-xxi.]

INTERFERENCE WITH THE WORK OF THE OFFICE.

Secretary Baker said:

"During the past few months there have been frequent interruptions of the work of your Secretary, because of threatened displacement from the rooms, which since the completion of the Capitol have been occupied by the office of this Board. Work on such subjects as the proposed document on the Restriction and Prevention of Consumption has had to give place to work for the defence of the right to undisturbed place for work during the intervals of legislative sessions. It is now understood that the Board of Auditors has assigned to the new State Bureau of Banking the rooms which this Board has occupied since the capitol was built. The following is a brief history of the law on the subject:

[Not necessary to print here. Printed in another place in this volume.]

In dealing with the subject before the Board of State Auditors, the legal objections have not been mentioned, except briefly in answer to a single question.

In addition to what had been previously done, the following letter was sent to the Board of Auditors, just before its proposed meeting September 10:

Lansing, Mich., Sept. 9, 1889.

To the Honorable the Board of State Auditors:

GENTLEMEN—At the last meeting of the Board of State Auditors, for various reasons (which it is not worth while to mention) I was not able to present the reasons against the removal of this office as I wished. However, in communications sent to individual members some of the reasons were given.

The office of the State Board of Health is in communication with over 4,500 health officials in Michigan (presidents, clerks and health officers of local boards of health) and those of them who have visited the office have found it in the same place since the Capitol was constructed. They find the present location convenient, because they frequently have other business to transact at the Capitol, and many of them would not go down to the old State block. During the last sixteen years thousands of those who have been local health officials have, through the exertions of the State Board, become interested in public health work and they continue active for good in their localities. Each year a certain proportion of these 4,500 health officials go out of office and are replaced by those who know nothing of the work and some of them care nothing about it because elected with a view to other work as supervisors, clerks etc. An important part of the work of the State Board of Health is to influence these officers to active effort for the prevention of sickness and deaths. When they visit the Capitol incidentally, and on other business, and take occasion to look over the work of this office they usually become enlisted in public-health work, and an influence for good in their localities, as afterwards evidenced by their prompt and thorough reports which are then used by the State Board of Health for the benefit of other localities. To make this office difficult of access to such men would be a great detriment to the public service.

The public interests which the State Board of Health is set to guard must be conceded to be as high as any other interest. Statistics which cannot be questioned prove that through influences started by this Board thousands of lives have been saved in this State. For instance, one life a day is saved in Michigan by the restriction of diphtheria. Interference with the public health service, for a day even, means sickness which should be prevented—it means death to some person.

For these and many other reasons, I respectfully ask the State Board of Auditors to reconsider the action taken at its last meeting in assigning the rooms occupied by this Board to another Bureau, or branch of the State government.

Very respectfully,

HENRY B. BAKER, *Sec'y.*

The subject was discussed, but it was thought that, on further investigation, the Board of State Auditors would probably not insist upon the displacement of the office of the State Board of Health.

TRANSPORTATION OF DEAD BODIES.

The Secretary presented the preamble, resolution and "Rules for Transportation of Dead Bodies, as adopted by National Association of General Baggage Agents," at their meeting in Detroit, August, 1889, and which it is proposed by them to put in force throughout this country "on and after December 1, 1889, or so soon thereafter by each line as may be." (Two enclosures accompanied the above blank "Certificate of Undertaker" and blank "Transit Permit" with stub, both numbered "8950;" also a letter signed by the several general baggage agents in Michigan.)

At the recent special meeting of this Board at Ionia, September 24, these had been considered, and on motion of Dr. Kellogg, the "rules" adopted by the general baggage agents were approved, subject, however, to the law in Michigan, which, in §1636 Howell's Statutes provides that any local board of health "shall also make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from their township [city or village, as the case may be*], or into, or from any vessel; and if any person shall violate any such regulation, he shall forfeit a sum not exceeding one hundred dollars."

* §1661 Howell's statutes.

The secretary was instructed to communicate to the secretary of the National Association of General Baggage Agents, this action by this Board, and the above-quoted law bearing upon this subject.

The effect of the law is that if any local board of health has made and published, as previously recommended by the State Board of Health, a regulation that no person sick with or body of a person dead from a dangerous communicable disease shall enter the jurisdiction of that board except in accordance with a permit by the local board or its health officer, then the penalty may be enforced in any case regardless of the rule by the railroad authorities and its approval by the State Board of Health. This was why the Secretary of this State Board of Health had recommended that the rules by the railroad authorities should include a provision for obtaining the permit of the health officer of the locality *into* which the body of a person dead of a *dangerous communicable disease* is to be taken, no *such* body being carried by a railroad company except such permit is first obtained.

RULES FOR TRANSPORTATION OF DEAD BODIES ADOPTED BY NATIONAL ASSOCIATION OF GENERAL BAGGAGE AGENTS, AUG., 1889.

RULE 1. The transportation of bodies of persons dead of Small Pox, Asiatic Cholera, Leprosy, Typhus Fever, or Yellow Fever, is absolutely forbidden.

RULE 2. The bodies of those who have died of Diphtheria, Anthrax, Scarlet Fever, Puerperal Fever, Typhoid Fever, Erysipelas, Measles, and other contagious, infectious, or communicable diseases must be wrapped in a sheet thoroughly saturated with a strong solution of bi-chloride of mercury, in the proportion of one ounce of bi-chloride of mercury to a gallon of water; and encased in an air-tight zinc, tin, copper or lead lined coffin, or in an air-tight iron casket, hermetically sealed, and all enclosed in a strong tight wooden box; or the body must be prepared for shipment by being wrapped in a sheet and disinfected by solution of bi-chloride of mercury as above, and placed in a strong coffin or casket, and said coffin or casket encased in a hermetically sealed (soldered) zinc, copper, or tin case, and all enclosed in a strong outside wooden box of material not less than one inch and a half thick.

RULE 3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by articles which have been exposed to the infection of the disease. And in addition to permit from Board of Health or proper health authority, agents will require an affidavit from the shipping undertaker, stating how body has been prepared and kind of coffin or casket used, which must be in conformity with Rule 2.

RULE 4. The bodies of persons dead of diseases that are not contagious, infectious, or communicable, may be received for transportation to local points in same State; when encased in a sound coffin or metallic case, and enclosed in a strong wooden box, securely fastened so it may be safely handled. But when it is proposed to transport them out of the State to an interstate point (unless the time required for transportation from the initial point to destination does not exceed 18 hours) they must be encased in an air-tight, zinc, tin, copper or lead lined coffin, or an air-tight iron casket, or a strong coffin or casket encased in a hermetically sealed (soldered) zinc, copper or tin case, and all enclosed in a strong outside wooden box of material not less than one inch thick. In all cases the outside box must be provided with four iron chest handles.

RULE 5. Every dead body must be accompanied by a person in charge who must be provided with a ticket, and also present a full first-class ticket marked "Corpse," and a transit permit from Board of Health, or proper health authority, giving permission for the removal, and showing name of deceased, age, place of death, cause of death (and if of a contagious or infectious nature), the point to which it is to be shipped, medical attendant, and name of undertaker.

RULE 6. The transit permits must be made with a stub to be retained by the person issuing it, the original permit must accompany the body to destination, and two coupons; the first coupon to be detached by agent at initial point and sent to the General Baggage Agent, and the second coupon, by the last Train Baggageman. The stub, permit and coupons, must be numbered so the one will refer to the other, and on back of permit will be a space for undertaker's affidavit, to be used in cases of contagious or infectious diseases as required by Rules 2 and 3.

RULE 7. The box containing corpse must be plainly marked with paster, showing name of deceased,

place of death, cause of death, the point to which it is to be shipped, number of transit permit issued in connection, and name of person in charge of the remains. There must also be blank spaces at bottom of paster for station agent at initial point, to fill in the form and number of passage ticket, where from, where to, and route to destination of such ticket.

□RULE 8. It is intended that no dead body shall be moved which may be the means of spreading disease, therefore, all disinterred bodies, dead from any disease or cause, will be treated as infectious and dangerous to the public health, and will not be accepted for transportation unless said removal has been approved by the State Board of Health, and the consent of the health authority of the locality to which the corpse is consigned, has been first obtained, and the disinterred remains enclosed in a hermetically sealed (soldered) zinc, tin, or copper lined coffin or box encased in hermetically sealed (soldered) zinc, tin, or copper cases.

The Michigan Central Railroad publishes the foregoing rules, to take effect January 1, 1890. It must be conceded that the railroad authorities are doing more in this direction than ever before to protect the public health.

Rules similar to the ones adopted by the National Association of General Baggage Agents, Aug., 1889, and adopted and published by the Michigan Central Railroad Co., to take effect Jan. 1, 1890, were also published by the Detroit, Lansing & Northern and Saginaw Valley & St. Louis Railroads, to take effect the same date (Jan. 1, 1890), and the following instructions were printed on the published rules:

Agents at the initial stations will be held responsible for enforcement of these rules, and will know that they have been complied with before selling passage ticket, or accepting any dead body for shipment.

It is intended that when the dead body has been accepted by an agent of this company for shipment to any point of this company's lines or to points on connecting lines with through car service (either coaches or sleepers) *via* this line, the arrangements at the initial station will insure its going to its destination without further trouble to the party accompanying it, therefore, the passage ticket in such cases will be taken up by the Agent at initial station and handed to the train Baggageman, to be given to Conductor of train. In case of transfer to another division or connecting line, the train Baggageman will bill both corpse and ticket to connecting Train Baggageman, same as baggage.

In case there is a transfer at any point to a connecting line the Agent at the initial station will detach the Detroit, Lansing & Northern coupon only (or the coupon of the connecting line with through car service) and return balance of ticket to party accompanying corpse and will plainly inform them that they must personally attend to it at such point of transfer, show transit permit, and surrender such portion of passage ticket as may be necessary.

The transit permit should be left in the possession of the party accompanying the corpse, and his authority for landing it at its destination; the initial Agent simply examining it to know that it is correct to verify the information given on the box, and to detach his coupon.

The Terminal Agent will arrange to secure the last transit coupon for the terminal line or Train Baggageman.

To take effect January 1st, 1890.

The following blank-form shows what facts are required to be in the hands of the Secretary of the Michigan State Board of Health before he will issue a permit for the transportation of bodies dead of a dangerous communicable disease:

Before the Secretary can issue a statement which will answer the purpose of a permit for the transportation of a dead body, it is necessary for him to have the following:

1. A certificate of the cause of death, by the attending physician, including not only the immediate cause of death, but also the sickness which led up to it.
2. The permit of the health officer of the place *from* which the body is to be removed.
3. The permit of the health officer of the place *to* which the body is to be removed.
4. The assurance of the health officer of the place from which the body is to be removed, that the body shall be carefully prepared for transportation, strictly in accordance with "Rule 8" of the General Baggage Agents' "Rules" which have been approved by this Board, and which may be seen at each railroad station.

BLANK FOR PERMIT FOR REMOVAL OF A DISINTERRED CORPSE.

To whom it may concern:

Permission having been granted by _____, health officer of _____ _____ county, Michigan, for the removal of the remains of _____ dead of _____, since _____, 189__, from _____ _____, and permission having been granted by _____, health officer of _____ for reinterment at _____, and the health officer of _____ having certified that "the body shall be carefully prepared in accordance with the rules of the Association of General Baggage Agents," therefore, when the body is so prepared, it would seem that the "Rules for the Transportation of Dead Bodies, Adopted by the National Association of General Baggage Agents, Aug., 1889," and which have been approved by this Board, will then have been complied with.

_____,
Secretary of the Michigan State Board of Health.

NEW METHOD OF COMPARING SICKNESS IN WEEKS, MONTHS AND QUARTERS.

The weekly bulletins, "Health in Michigan," issued previous to October 9, 1889, the monthly bulletins previous to September, 1889, and the quarterly reports preceding that for the second quarter of 1889, have mentioned the increase or decrease of those diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the disease in the current week, month or quarter, and in the preceding week, month or quarter or in the corresponding month or quarter in preceding years.

In bulletins and reports subsequent to those mentioned above, those diseases will be mentioned of which the comparison shows an increase or decrease of twenty-five per cent from the preceding week, month or quarter, or from the monthly or quarterly normal, as the case may be.

The new method has the effect of calling attention to changes in the prevalence of diseases, which, like diphtheria and scarlet fever, are important, yet which are not usually reported by a very large number of observers, and therefore under the old plan would not be mentioned.

The Secretary presented his quarterly report on the condition of health in Michigan, as follows:

HEALTH IN MICHIGAN IN THE SECOND QUARTER OF 1889.

Communicable Diseases.

Compared with the preceding quarter (January, February and March, 1889), reports received from all sources show diphtheria to have decreased by an average of seventeen places per month, scarlet fever to have decreased by an average of sixteen places per month, typhoid fever to have decreased by an average of nine places per month, measles to have increased by an average of nine places per month, and small-pox to have decreased by an average of eight places per month.

Meteorology, and Sickness from all Causes Compared with the Preceding Quarter.

A comparison of meteorological conditions of the second quarter of 1889, with the meteorological conditions of the preceding quarter shows the temperature to have been considerably higher, the absolute humidity to have

been much more, the relative humidity to have been less, and the day and the night ozone to have been more in the second quarter of 1889.

Compared with the preceding quarter (January, February and March), the reports show a marked increase of cholera morbus, measles, cerebro-spinal meningitis, intermittent fever and inflammation of kidney, and a marked decrease of small-pox, membranous croup, pneumonia, typhoid fever (enteric) and pleuritis in the second quarter of 1889.

This Quarter Compared with the Average for Three Years, 1886-1888.

A comparison of the meteorological conditions of the second quarter of 1889 with the average of corresponding quarters in the three years, 1886–1888, shows that in 1889 the temperature was slightly lower, the absolute humidity slightly less, the relative humidity the same, and the day and the night ozone were more in the second quarter of 1889.

Compared with the average for the corresponding quarters in the three years, 1886–1888, the reports received from regular observers indicate that small-pox, cholera infantum, membranous croup, cholera morbus, measles, dysentery, inflammation of bowels, inflammation of brain, diphtheria and cerebro-spinal meningitis were less prevalent, and there was no disease much more than usually prevalent in the second quarter of 1889.

The Secretary presented his quarterly report of the condition of health in Michigan, as follows:

HEALTH IN MICHIGAN IN THE THIRD QUARTER OF 1889.

Communicable Diseases.

Compared with the preceding quarter (April, May and June, 1889,) reports received from all sources show diphtheria to have increased by an overage of four places per month, scarlet fever to have decreased by an average of twenty places per month, typhoid fever to have increased by an average of twenty-five places per month, measles to have decreased by an average of ten places per month, and small-pox to have decreased by an average of one place per month.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the third quarter of 1889, with the meteorological conditions of the preceding quarter shows the temperature to have been considerably higher, the absolute humidity to have been more, the relative humidity to have been slightly more, and the day and the night ozone to have been less in the third quarter of 1889.

Compared with the preceding quarter (April, May and June, 1889), the reports from regular observers show a marked increase of cholera infantum, cholera morbus, dysentery, diarrhea, typhoid fever (enteric), typho-malarial fever, inflammation of bowels, cerebro-spinal meningitis, and inflammation of brain, and a marked decrease of scarlet fever, pneumonia, membranous croup, influenza, measles, pleuritis and tonsillitis, in the third quarter of 1889.

This Quarter Compared with the Average for Three Years, 1886–1888.

A comparison of the meteorological conditions of the third quarter of 1889 with the average of corresponding quarters in the three years, 1886–1888, shows that in 1889 the temperature was slightly higher, the absolute humidity was the same, the relative humidity and the day and the night ozone were slightly more in the third quarter of 1889.

Compared with the average for the corresponding quarters in the three years, 1886–1888, the reports received from regular observers indicate that small-pox, membranous croup, scarlet fever, diphtheria, puerperal fever, typhoid fever (enteric) and measles were less prevalent, and that cerebro-spinal meningitis and inflammation of kidney were more than usually prevalent in the third quarter of 1889.

REGULAR MEETING, JANUARY 14, 1890.

At the usual hour of calling the meeting to order, the following members were present: Hon. John Avery, M. D., President; John H. Kellogg, M. D.; and Henry B. Baker, M. D., Secretary.

The Secretary presented letters from Prof. Delos Fall and Arthur Hazlewood, M. D., stating that they could not be present at the meeting.

A telegram was received from Dr. V. C. Vaughan, stating his inability to be present.

Owing to there not being a sufficient number of members present to form a quorum, no business could, legally, be transacted, and the Board adjourned.

This was the first time in the history of this Board that there have failed to be present, sufficient members to form a quorum, at the time at a regular meeting of the Board.

The Secretary's quarterly report of the condition of health in Michigan is as follows:

HEALTH IN MICHIGAN IN THE FOURTH QUARTER OF 1889.

Communicable Diseases.

Compared with the preceding quarter (July, August and September, 1889), reports received from all sources show *diphtheria* to have increased by an average of *thirty-six* places per month, *scarlet fever* to have increased by an average of *forty* places per month, *typhoid fever* to have increased by an average of *forty-nine* places per month, *measles* to have increased by an average of *nine* places per month, and *small-pox* to have increased by an average of *one* place per month.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the fourth quarter of 1889, with the meteorological conditions of the preceding quarter, shows the temperature to have been much lower, the absolute humidity and the day and night ozone considerably less, and the relative humidity slightly more in the fourth quarter of 1889.

Compared with the preceding quarter (July, August and September,

1889), the reports from regular observers show a marked increase of scarlet fever, diphtheria, pneumonia, measles, influenza, membranous croup, tonsillitis, typhoid fever (enteric), pleuritis, puerperal fever and small-pox, and a marked decrease of cholera infantum, cholera morbus, dysentery, diarrhea and cerebro-spinal meningitis, in the fourth quarter of 1889.

This Quarter Compared with the Average for the Three Years, 1886-1888.

A comparison of the meterological conditions of the fourth quarter of 1889, with the average of corresponding quarters in the three years 1886-1888, shows that in 1889 the temperature was slightly higher, the absolute humidity was more, the relative humidity was about the same, and the day and the night ozone were less in the fourth quarter of 1889.

Compared with the average for the corresponding quarters in the three years, 1886-1888, the reports received from regular observers indicate that cholera infantum, cholera morbus, cerebro-spinal meningitis and membranous croup were less prevalent and that puerperal fever, measles and small-pox were more than usually prevalent in the fourth quarter of 1889.

PROCEEDINGS OF A SPECIAL MEETING OF THE MICHIGAN STATE BOARD OF HEALTH, AT LANSING, MARCH 13, 1890.

The Board was called to order at 2 P. M., at the State Reform School, and the following members were present: Hon. John Avery, M. D., President, Greenville; Victor C. Vaughan, M. D., Ann Arbor; Prof. Delos Fall, M. S., Albion, and Henry B. Baker, M. D., Secretary, Lansing. Arthur Hazlewood, M. D., Grand Rapids, came in soon after roll call.

The State Board of Health had been convened mainly for the purpose of the examination of the plans and specifications of a proposed building at the State Reform School. The report, on the examination of the plans and specifications, is printed in this Annual Report of the State Board of Health.

After the examination of plans, site, etc., the Board met at the Capitol. State Board of Health vouchers from No. 1834 to 1865, inclusive, were allowed.

It was voted that Dr. Baker be appointed a delegate to the National Conference of State Boards of Health which was to meet in Louisville. Also voted that Drs. Avery and Hazlewood be appointed delegates to the meeting of the American Medical Association.

Dr. Baker read a proposed circular on the Restriction and Prevention of Consumption. The Secretary was directed to brief the proposed circular, and present it at the next meeting.

It was voted that the Secretary write out the minutes of this meeting, and the report on the examination of the plans for the buildings at the State Reform School, and transmit a copy of the Board's report of the examination to the Superintendent of the State Reform School.

REGULAR MEETING, APRIL 15, 1890.

[158.]

The annual meeting of the Michigan State Board of Health was held in the State Capitol in Lansing, April 15, 1890. The members present were

as follows: Hon. John Avery, M. D., President; Arthur Hazlewood, M. D., Prof. Delos Fall, and Henry B. Baker, M. D., Secretary.

At the morning session, besides routine business, such as the examination and auditing of bills and accounts, Dr. Avery reported that the committee had made progress on the plans for model school-houses, and stated that the system of ventilation would be such as the Board had before recommended, with a separate foul-air shaft for each room.

VENTILATION OF SCHOOL-HOUSES.

The Secretary presented a communication from Albert McCaleb, building contractor, Chicago, concerning the heating and ventilation of school-houses in accordance with the recommendations in the first Annual Report of the Michigan State Board of Health. Selections from this letter are as follows:

"*Chicago, Ill., March 15, 1890.*

"DR. BAKER, *Lansing, Michigan:*

DEAR SIR—It may be of interest to you to know that a system for ventilating which embodies the construction proposed by Dr. Kedzie in his first report on school hygiene to your board, in 1873, has been in successful operation as a part of the heating system in a number of schools in this vicinity.

"The defects noticed have been just what Dr. Kedzie mentioned in his first reports, and those mentioned at various times by your board members, such as unequal ventilation of rooms, especially those farthest from the flues, or reversal of currents through the building caused by adverse winds, foul weather, etc., thereby causing 'back drafts,' and, when closets were used, perceptible odors in school rooms. Much complaint was caused, but no remedy has as yet been applied.

"When new school buildings were erected the boards investigated many devices, but adopted a method directly in line with Dr. Kedzie's recommendations, combined with a system of furnace-heating. Briefly described, the system is as follows:

"Powerful furnaces, filled with vertical air tubes, are placed in a '*battery*' in a central location. These are inclosed in brick in such manner that the air from all mingles in a common head. This head, or warm air chamber, is as high as circumstances will permit. Every room requiring heat is provided with a brick heat flue, and each flue is connected by metal pipes to the warm air chamber.

"The advantages of the 'battery' arrangement are obvious. One fire warms the whole house in mild weather, and no fuel is wasted. Much labor and fuel are saved.

"'Fresh air is supplied to the battery by the following arrangement: A large fresh air receiving-room is placed directly behind and connected to the 'battery.' Ducts of large size supply this room from all sides of the house. Each duct is fitted with automatic valves in such manner that those on the windward side are always open, receiving a full supply of fresh air, crowded in by whatever force the wind may give, while those valves on the opposite side are closed by the same force. A sudden change of wind changes instantly the position of the valves and no diminution of supply is noticed. The tendency of the wind to come through the warm air pipes in gusts is overcome by the elasticity of the air in the cold air receiving room. Thus it will be seen that a steady supply of fresh air is assured.

"Dr. Kedzie's plan of ventilating is carried out; though in a slightly modified manner. The large flue recommended by him, divided by partitions into a number of smaller flues, is expensive and not always practicable. It has been found much cheaper, and the results have been better, to build in the partition walls a ventilating flue for each room. These flues are placed side by side with heat and smoke flues, in such manner that some heat is imparted to assist the ventilation.

"As a matter of economy and to save space, it is customary to stop off the heat-flues for first floor rooms, then continuing on and using the same flues to ventilate the second story rooms.

"The floors of each room are furred up from the joists by two strips, making the air space continuous. The spaces around the circumference of each room are stopped off with mortar and boards, with the result that the space under the floor of each room is an air-tight box. Air can enter it from no source whatever, except from the room to be ventilated. The air from the room is permitted to enter this space through grated openings placed at intervals in the room, and thence passes into the flue through a large opening provided below the floor.

"If summer ventilation is desired by means of the flue, a small gas or oil heater is placed in each flue to accelerate the current.

"The result in every case has been that the ventilation is equal and reliable and not affected by outside influences.

"Reverse currents or regurgitation of air from one room to another is impossible. As the air is carried through the shortest possible path, no motive power is wasted in overcoming friction, as in the Smead system. By isolating each room, a 'slow-burning' construction is obtained.

* * * "The heating and ventilating system without closets is in use in Marshall, Minn., Madison, Wis., Racine and Beloit, Wis.

* * * "I inclose plan of Duncan avenue school, Hyde Park, to illustrate the foregoing description.

"I have erected school buildings in which the Ruttan system is used and am now erecting two buildings with the above system of independent ventilation embodied. One of the boards for whom I am now building had intended to use the Ruttan, and drew their plans accordingly, but upon investigation quickly changed and adopted the system above described.

"Respectfully,

"ALBERT MCCALEB,

"*Building Contractor.*"

[Reprints from the following on "Restriction of Measles," to the number of 1,200 were made in May, 1890. They have been sent as a "measles document," to be distributed in places where the disease was present.]

THE RESTRICTION OF MEASLES.

The question is frequently asked the office of the State Board of Health: Should measles be restricted in the same manner as other dangerous communicable diseases?

At this meeting of the Board the Secretary presented facts, opinions and statistics in Michigan and elsewhere bearing on the questions: At what age is measles most severe? and at what period of the disease is measles most communicable? Some of this evidence is as follows:

TABLE 1.—*Exhibiting the number of Deaths from Measles in persons under five years of age and in each year under five, together with the total number of Deaths from Measles in persons of all ages in the United States for the three, and for each of the three census years. (Compiled from the Eigth, Ninth and Tenth Censuses of the United States.)*

Years.	All Ages.	Under 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	Under 5.
1860	3,899	760	884	646	332	188	2,810
1870	9,287	1,871	2,222	1,257	728	387	6,465
1880†	8,072	2,008	1,621	982	584	388	5,483
Sum	21,208	4,639	4,727	2,885	1,594	913	14,758
Average	7,069	1,546	1,576	962	531	304	4,919
		3,122*					

*Over half of all deaths occur in children under two years of age, and the numbers average greatest in the second year.

†The numbers in this line except under "All Ages," are computed from the "Deaths in Each One Thousand Deaths At Known Ages, Classified by Age, Sex and Cause." Tenth U. S. Census (1880) Vol. XII, Mortality and Vital Statistics, Part II, Table XVI, p. 366.

TABLE 2.—*Exhibiting, relative to 96 outbreaks, 927 cases of Measles, in Michigan, in 1887, the number of Cases and Deaths, and the Per Cent of Deaths to Cases in each ten-year Period of Age.*

Of All (Ninety-six) Outbreaks.	Of All Outbreaks. Total.		Reported Cases and Deaths—by Periods of Age.											
			Under 10.		10 to 20.		20 to 30.		30 to 40.		40 to 50.		50 and over.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Total cases and deaths at each period.	927	23	545	18	268	0	90	1	15	2	5	1	4	1
Per cent of deaths to cases	2.5*		3.3		0		1.1		13.3		20		25	

TABLE 3.—*Exhibiting, relative to 2,484 (all in which the ages were reported) cases of* MEASLES *in Michigan in 1888, the number of Cases and Deaths, and the Per Cent which the Deaths were of the Cases in several periods of ages.*

	Reported Cases and Deaths within Certain Ages.						
	All Ages.	Under 10 yrs.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 and over.
Number of Cases	2,484	1,303	842	216	86	28	9
Number of Deaths	48	34	7	3	2	2	0
Per Cent the Deaths were of the Cases	*1.9	2.6	0.8	1.4	2.3	7.1	0

*The per cent which the deaths are of the cases, as here given, relates only to those cases for which the age of the patient was stated in the report.

From tables 1, 2 and 3 it appears that between the ages of ten and twenty years the deaths from measles are but a very slight per cent of the cases, being, in fact, in the year 1887, zero, and in the year 1888 only eight-tenths of one per cent. Possibly, if the statistics were compiled for five year periods instead of ten year periods, the result might be different.

The question arises whether, if children were carefully protected from this disease until this favorable age were reached, and were then permitted to have the disease in isolation hospitals (or otherwise subjected to proper isolation), the deaths from this disease would not be reduced to a minimum, and the sickness as mild or milder than that produced by vaccination.

This experience in Michigan is similar to the expressed opinion of medical writers. William Squire in Quain's Medical Dictionary, states: "With us more than half of the whole number of deaths from measles are of children under two years of age."

To quote from Thomas: "The age of the patients is, under all conditions, of the greatest influence upon the mortality of measles. Disregarding the fact that healthy and very young children (up to about the age of six months) probably from their feebler predisposition, are attacked very mildly, if at all, the rule may be laid down that measles is essentially dangerous only for young or very young children; that its danger decreases rapidly with the accession of years, and in the late years of childhood is already at a minimum; in old people who have, however, but little predisposition and are rarely attacked, the disease is again dangerous. Exceptions to this are not often reported."

The Time When Measles is Most Contagious.

William Squire (Quain's Medical Dictionary): "The catarrhal stage, infectuous throughout, is often mistaken for a common cold, and no timely separation is attempted. The cough is an important means of conveying the infection at this time. * * *. Infection begins before the rash appears, and the contagium may be given off by the third day, most probably during the greater part of the incubation period. The contagious principle, developed only in the bodies of the sick, is found during the height of the disease in the tissues, the secretions, the blood and the breath." "After an attack of measles personal infection is probably over by the end of a month; it may persist longer, or be conveyed somehow by convalescents for another month. How long infection may cling to articles of clothing, or linger in closed rooms, is uncertain." On the fourth day of the initial fever the eruption appears and continues four days.

Wood's Reference Hand Book states: "Although the nature of the disease may be conjectured during the prodromal stage, it is only during the eruptive stage that the diagnosis of measles can be definitely determined." "The danger of contagion is proportionate to the propinquity of the contaminating influence, being greatest in the sick room. It can not be denied that measle may be spread by mediate contagion. In such cases the clothing probably becomes the disseminating agent. * * * Except small-pox measles is probably the most contagious of the exanthemata and is communicable from the early prodromal stage until desquamation is completed. The infectious properties are probably most active during the prodromal stage. The great difficulty of identifying measles during this stage in great measure explains the rapid dissemination of the disease in schools, asylums, etc. The contagious properties continue throughout the stage of eruption, but speedily diminish with it and probably become extinct during desquamation."

I. N. Brainerd, M. D., of Alma, Michigan, in a letter to this office bearing on this subject, dated March 8, 1890, states:

"Dr. Hardaway, Professor of diseases of the skin in the St. Louis Post-graduate School of Medicine and in the Missouri Medical College, St. Louis, and President of the American Dermatological Association, says: 'Various circumstances render it probable that measles is most readily propagated during the stage of efflorescence.'—*Pepper's System of Medicine, Vol. I, page 560.* This being the case, the most infectious stage of the disease is not passed before the disease can be recognized and notice of its presence be given. It is true that measles is communicable during the four days of prodromal fever, during the five days of efflorescence and during the five days (about) of exfoliation. Conceding that we can offer no protection during the first four days, shall we therefore offer no protection during the remaining ten days? * * * * Hardaway says: 'Leaving out of account sucklings under six months of age, in whom measles is rare and said to be slight, most deaths from the disease [measles] occur among very young children, from the greater liability to complications. According to Beddoes, the mortality from measles is, beyond all comparison, greatest in the second year of life.'—*Pepper, Vol. 1., p. 578.* Vital Statistics of Michigan, 1885, says, p. 221, that 84.22 per cent of the deaths from measles in that year occurred in children under five years of age, and that only 2.63 were above twenty years of age."

Importance of Restricting Measles.

Quain's Dictionary states: "The annual mortality from measles in London is nearly five per ten thousand." In Michigan the *reported* deaths from measles for the twelve years, 1876–1887, average 146 per year. If we assume that only three-fourths of the deaths were reported, the deaths in Michigan from measles have been about two hundred per year.

In Measles, premises should be placarded and finally disinfected

After considerable discussion, the members of the Board expressed the opinion that health officers should placard premises where measles exists, and, after death or recovery, should disinfect premises, as in outbreaks of other diseases "dangerous to the public health," measles being such a disease, and as such coming under the law requiring the health officer to take such action. The law also requires that measles shall be reported by householders, physicians, and health officers.

SANITARY CONVENTIONS.

Sanitary Conventions will be held under the auspices of the Board at Battle Creek, June 25 and 26; Alpena, July 10 and 11, and at Charlevoix, August 14 and 15.

EXAMINATION OF PLANS FOR PROPOSED NEW BUILDING AT THE MICHIGAN STATE REFORM SCHOOL.

The law requires that before the final adoption of plans for proposed new buildings at the State Institutions they shall be submitted to the State Board of Health for its opinion relative to the provisions for the heating, ventilation, sewerage and other sanitary appliances and arrangements. Boards of control of the several State Institutions are not required

to adopt plans approved by the State Board of Health or to reject plans disapproved by this Board; but this method supplies State boards of control with reports of the opinions of the State Board of Health of plans submitted to them by architects and others, and with such suggestions for improvement as the State Board of Health may offer.

At this meeting of the State Board of Health, plans for a proposed new main building at the State Reform School were submitted, and were carefully examined. (A committee of this Board, consisting of Drs. J. H. Kellogg and Henry B. Baker, had previously examined them.) The Secretary was directed to transmit the report to the Board of Control of the State Reform School, and a copy is printed in this report, pages xv–xix.

The Secretary presented his Reports of Work in the Office of the State Board of Health during the quarters ending January 14, 1890, and April 10, 1890. [Abstracts of them are printed in this Report, pages xxi–xxiii.]

The Secretary presented his Quarterly Report on the condition of health in Michigan, as follows:

HEALTH IN MICHIGAN IN THE FIRST QUARTER OF 1890.

Communicable Diseases.

Compared with the preceding quarter (October, November and December, 1889), reports received from all sources show *diphtheria* to have decreased by an average of *three* places per month, *scarlet fever* to have increased by an average of *three* places per month, *typhoid fever* to have decreased by an average of *forty-eight* places per month, *measles* to have increased by an average of *fifty-one* places per month, and *small-pox* to have increased by an average of *one* place per month.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the first quarter of 1890, with the meteorological conditions of the preceding quarter, shows the temperature to have been lower, the absolute humidity to have been less, the relative humidity to have been slightly more, and the day and the night ozone to have been considerably more in the first quarter of 1890.

Compared with the preceding quarter (October, November and December, 1889), the reports from regular observers show a marked increase of influenza, pneumonia, cerebro-spinal meningitis, measles, pleuritis and membranous croup, and a marked decrease of typho-malarial fever, typhoid fever (enteric), cholera infantum, small-pox, cholera morbus, dysentery, inflammation of brain, puerperal fever, intermittent fever, remittent fever, diphtheria, diarrhea and scarlet fever in the first quarter of 1890.

This Quarter Compared with the Average for Four Years, 1886–1889.

A comparison of the meteorological conditions of the first quarter of 1890, with the average of corresponding quarters in the three years, 1886–1889, shows that in 1890 the temperature was slightly higher, the absolute humidity was more, the relative humidity was slightly less, and the day and the night ozone were more in the first quarter of 1890.

Compared with the average for the corresponding quarters in the four

years, 1886–1889, the reports received from regular observers indicate that influenza and measles were more than usually prevalent, and that typho-malarial fever, typhoid fever (enteric), small-pox, scarlet fever, cholera morbus, puerperal fever, dysentery and diphtheria were less prevalent in the first quarter of 1890.

HENRY B. BAKER,
Secretary.

ABSTRACT OF PROCEEDINGS OF THE STATE BOARD OF HEALTH, AT ITS MEETING, BATTLE CREEK, JUNE 25, 1890.

The members present were: Henry F. Lyster, M. D., Detroit; Prof. Delos Fall, M. S., Albion; John H. Kellogg, M. D., Battle Creek, and Henry B. Baker, M. D., Secretary, Lansing.

At this special meeting, during the time of the Sanitary Convention, State Board of Health Vouchers from No. 1888 to 1905, inclusive, were allowed.

WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1890.

Much of the work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping is adhered to so far as is practicable without repetition.

COLLECTION AND COMPILATION OF INFORMATION.

SPECIAL REPORTS RELATIVE TO DANGEROUS COMMUNICABLE DISEASES.

Every health officer is supplied with blanks "L" from this office, for reporting outbreaks of diphtheria, typhoid fever, scarlet fever, small-pox, measles, etc. (dangerous communicable diseases), to the Secretary of the State Board of Health.

Upon the receipt of the report of an outbreak of such disease, blanks "M" for weekly reports during the outbreak, and a blank for a final report at the close of the outbreak are sent, with a circular letter, ("Blue Letter"), also a number of pamphlets containing instructions for the suppression of the disease. These pamphlets are to be distributed to the neighbors of the family in which the disease is, in order to obtain their coöperation with the health officer. About 1,600 outbreaks of such diseases were thus attended to during the fiscal year ending June 30, 1890.

SICKNESS STATISTICS; WEEKLY POSTAL-CARD REPORTS OF ALL IMPORTANT DISEASES IN 1889-90.

The weekly postal-card reports of diseases, sent on cards furnished by the State Board of Health, have been received from health officers of cities and villages and other leading physicians, who contribute this valuable information, in different parts of the State. The plan of these weekly card-reports is stated on pages 90 and 91 of this Report; on page 91 is an example of these reports properly filled out. When a report of a new health officer of a city or village is received, a printed letter is sent (if health officer of a village it is [149], if of a city, a similar letter is sent) with a circular describing the plan of the reports, and transmitting supplies for making them.

A list of observers of diseases for the calendar year 1889 and a compilation of their reports, with a study of relations of sickness to climatic conditions is printed in this Report, pages 89-154. The sickness statistics of Michigan, based upon these weekly reports by the leading physicians in the State, are probably the most important sickness statistics in the world.

ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1889.

In December, 1889, a circular [152] which had been approved by the Board, was sent to the health officer of each township, city and village in the State, about 1,500 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular (65), which is printed on pages viii-ix of the Report for 1884. Blank form [I], for reports of health officers, is printed in former Reports. With the circular [152] was also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the Report for 1882.

Where the name of the health officer had not been returned to this office, the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city or township.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH FOR THE YEAR ENDING DEC. 31, 1889.

At the same time (December, 1889) that the circulars and blank forms were sent to the health officers, a circular [153] asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city and village in the State, about 1,500 in all. A blank form for a copy of his record of cases of diseases dangerous to the public health was also sent; the circular and blank form

sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

RETURN OF NAMES OF MEDICAL PRACTITIONERS.

About January 1, 1890, blanks for the return of names of Medical Practitioners were sent to each of the clerks of the townships, cities and villages, about 1,500 in number. An example of these blanks is printed on page xi of the Report of the Board for 1888.

NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES AND VILLAGES.

In April, 1890, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for returns of the names and postoffice addresses of health officers. The circular and blank forms used are similar to those printed on pages xiii-xiv of the Report for 1884. In June, 1890, a second demand was sent to localities from which no ret ırn had been made in response to the demand in April.

Through the systems of reports to the State Board of Health by its corps of correspondents as well as by the local health officers, the Secretary of the State Board often receives information of an outbreak of a communicable disease, and desires to communicate at once with the health officer; but if no health officer has been appointed in that locality, or no return of such appointment has been made, delays occur, and before the Secretary of the State Board can get into correspondence with the delinquent local board and a health officer can be chosen, the disease may spread widely within or without the limits of the village or township, with unnecessary sickness and loss of life.

It should be said that there is an increasing tendency to comply with this law, and local boards now act promptly and coöperate cordially with the State Board of Health in its endeavors to prevent the spread of dangerous communicable diseases.

METEOROLOGICAL REPORTS.

A list of meteorological observers for the calendar year 1889, with a statement of what registers were received from each, is printed in this Report. The reports are summarized in an article in this Report on the Principal Meteorological Conditions in Michigan in the year 1889. The data are of great value for the purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly, and a copy kept on file in the office.

DISSEMINATION OF INFORMATION.

PUBLISHED LIST OF NAMES AND ADDRESSES OF HEALTH OFFICERS.

The names and addresses of 1,268 health officers in Michigan were printed, in August, 1889, and a copy of the pamphlet sent to each health officer in Michigan, in order to facilitate his ready notification, to the health officer of any locality in this State, concerning the possible spread of any dangerous communicable disease; also to facilitate correspondence on any of the numerous questions with which health officers have to deal. The pamphlet was also sent to each of the delinquent boards of health, in the hope that, on seeing the blank where there should be the name of a health officer they would then comply with the law which requires the appointment of a health officer and the return of his name. In some instances that was the result. The pamphlet has also been useful, in the Office of the Secretary of the State Board, for several other purposes.

DISTRIBUTION OF INFORMATION HOW TO RESTRICT AND PREVENT DANGEROUS DISEASES.

Whenever information is received of the occurrence of diphtheria, scarlet fever, measles, small-pox, typhoid fever, or typho-malarial fever, copies of a document on the restriction and prevention of the disease reported are immediately sent to the health officer, with a request that he distribute them where they will be likely to be read, and it is suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger; and it is thought that after reading them they will be most likely to co-operate with the local health officer for the restriction of the diseases. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board in this manner—in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from scarlet fever or diphtheria, these being among the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diphtheria, scarlet fever, and small-pox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases [47] have been made into each of these languages; and copies are sent to local boards when so requested.

A record is kept of reports received and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information. A compilation of such information relative to several of the most important diseases is published in this volume.

PRINTING AND PUBLISHING OF PAMPHLETS, LEAFLETS AND DIAGRAMS OF INFORMATION.

In August 1889, 1,000 copies of the two-page leaflet diagrams "Scarlet Fever in Michigan in 1886," and the same in "1887," and 1,000 copies of the leaflet diagrams "Diphtheria in Michigan in 1886," and the same in "1887," were reprinted and distributed.

In Oct. 1889, 2,000 copies of each of the diagrams "Isolation and Disinfection Restrict Scarlet Fever" and "Isolation and Disinfection Restrict Diphtheria" exhibiting the evidence of the experience in Michigan in 1888, were printed for distribution. In May 1890 these two diagrams were again reprinted, to the number of 2,000 copies of each.

In Oct. 1889, 8,000 copies of the pamphlet [110] on the "Restriction and Prevention of Scarlet Fever" were printed for distribution.

Oct. 25, 1889, twelve hundred (1,200) copies of the pamphlet No. [161] on the prevention and restriction of "Typhoid and Typho-Malarial Fever" were printed.

In Nov. 1889, 2,500 copies of the "List of Publications of the Michigan State Board of Health which remain in print and may be had upon application" were reprinted from the Annual Report, and distributed.

In Dec. 1889, 500 copies of the diagrammatic leaflet "Chart I." and "Chart II." showing the relation of typhoid fever to sewerage and water supply, and, in June 1890, 1,000 copies of the same leaflets were printed for distribution.

In March 1890, the leaflet "Recent Saving of Life in Michigan" was reprinted from the Proceedings of the Vicksburg Sanitary Convention and widely distributed.

In April 1890, copies of "Dietary of State, Penal, Reformatory, and Charitable Institutions in Michigan," and "Model Diet Tables," prepared by Prof. Victor C. Vaughan, M. D., were reprinted from the Annual Report, and sent to State penal, reformatory and charitable institutions in Michigan.

In May 1890, 1,200 copies of a pamphlet [176] on the "Restriction and Prevention of Measles," were printed. These are used in the same way as are the pamphlets on the restriction and prevention of other dangerous communicable diseases—distributed to localities in which the disease is present, with request that the health officer give one to every neighbor of the house in which the disease is.

A pamphlet [120] "Work of Health Officers and Local Boards of Health" was revised and about 6,000 printed in May 1890. These are distributed to health officers and members of local boards of health, and to other persons who may need to know the duties of such officers, and the laws relative thereto.

As fast as the names and addresses of health officers for 1890 were received, a copy of the pamphlet [120] detailing the duties of health officers was sent to each, together with blanks for the prompt report of dangerous communicable diseases, and sample copies of the pamphlets on the prevention and restriction of diphtheria, scarlet fever, typhoid fever, typho-malarial fever, cholera and small-pox, a pamphlet reprint on the "Restriction and Prevention of the Dangerous Communicable Diseases," and a copy of each of two leaflets, diagrams, one exhibiting the experience in Michigan in 1886 and 1887 in restricting scarlet fever, the other exhibiting the experience in restricting diphtheria.

In June 1890, 1,000 copies of the diagram "Time of Greatest Danger from Typhoid Fever" were printed for distribution.

In June 1890, 1,000 copies of the diagram "Deaths in Michigan 1876-87 "showing the relative importance of the diseases which cause most deaths in Michigan," were printed for distribution.

HEALTH BULLETINS.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on the compilation, is sent for publication to a number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press Association. A specimen of this weekly health bulletin can be found on page xii of the Report of 1884.

Beginning with the month of August, 1884, a monthly health bulletin has been issued immediately after the close of each month, for the use of monthly sanitary and medical journals. Beginning with the bulletin for the month of September, 1889, a third column was added, being the average for the bulletin month in the preceding series of years, beginning with the year 1886. This enables the reader to make a comparison of the prevalence of diseases with the same disease in the same month for preceding years. An example of this form of bulletin is printed on following page.

HEALTH IN MICHIGAN, DECEMBER, 1889.

For the month of December, 1889, compared with the preceding month, the reports indicate that pneumonia, inflammation of kidney, measles, whooping-cough, inflammation of brain and small-pox increased, and that remittent fever, scarlet fever, typhoid fever, typho-malarial fever, dysentery and puerperal fever decreased in prevalence.

Compared with the preceding month, the temperature in the month of December, 1889, was much lower, the absolute humidity was less, the relative humidity and the day and night ozone were more.

Compared with the average for the month of December in the three years 1886-1888, inflammation of kidney, measles, whooping-cough, inflammation of brain and small-pox were more prevalent, and remittent fever, typho-malarial fever, dysentery, membranous croup, cerebro-spinal meningitis, cholera morbus and cholera infantum were less prevalent in December, 1889.

For the month of December, 1889, compared with the average of corresponding months in the three

years 1886-1888, the temperature was higher, the absolute humidity was more, the relative humidity was about the same, and the day and night ozone were slightly more.

Including reports by regular observers and others, *diphtheria* was reported present in Michigan in the month of December, 1889, at *fifty-seven* places, *scarlet fever* at *sixty-four* places, *typhoid fever* at *fifty-seven* places, *measles* at *twenty-two* places, and *small-pox* at *two* places.

Reports from all sources show *diphtheria* reported at *twelve* places less, *scarlet fever* at *seven* places less, *typhoid fever* at *twenty-six* places less and *measles* at *four* places *more* in the month of December 1889, than in the preceding month.

Reports to State Board of Health, Lansing, by observers in different parts of the State, show the diseases which caused most sickness in Michigan during the month of December (4 weeks ending December 28), 1889, as follows:

Number of reports received for this month, 197.	Per cent of reports stating presence of disease.		
Diseases arranged in order of greatest prevalence in this month.	Dec., 1889.	Nov., 1889.	Av. for Dec., 3 years, 1886-88.
Rheumatism	72	68	78
Neuralgia	68	68	69
Bronchitis	62	63	64
Tonsillitis	59	60	56
Consumption of lungs	52	49	51
Intermittent fever	44	45	42
Influenza	38	34	44
Pneumonia	31	22	34
Inflammation of kidney	27	21	21
Diarrhea	26	32	30
Erysipelas	24	27	24
Remittent fever	21	30	32
Pleurites	19	17	----
Inflammation of bowels	18	16	16
Measles	16	10	10
Whooping-cough	15	11	11
Diphtheria	12	11	12
Scarlet fever	9	12	11
Typhoid fever (enteric)	9	13	9
Typho-malarial fever	9	14	13
Inflammation of brain	7	5	5
Dysentery	5	11	7
Puerperal fever	4	6	4
Membranous croup	4	5	6
Cerebro-spinal meningitis	2	2	3
Cholera morbus	2	2	5
Small-pox	2	0.4	0.8
Cholera infantum	1	1	3

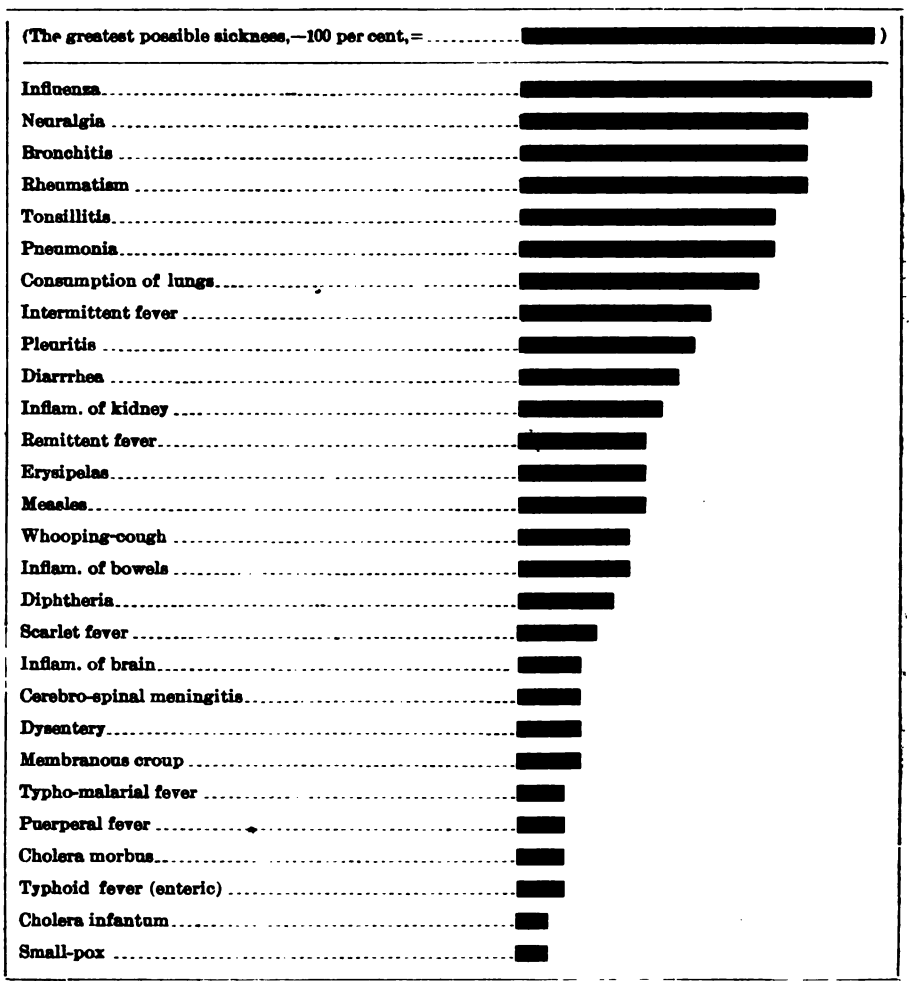
HENRY B. BAKER,

Lansing, Michigan, January 2, 1890. *Secretary.*

Beginning with January, 1890, a supplementary bulletin was prepared which graphically represents the prevalence of sickness from the principal diseases in the month for which the bulletin is issued. This is sent with the regular monthly bulletin for the same month. This graphic bulletin is as follows:

HEALTH IN MICHIGAN, FEBRUARY, 1890.

The Secretary of the Michigan State Board of Health says, that the weekly reports indicate comparative Sickness in Michigan during February, 1890, from each of the important diseases as follows:—



DIAGRAMS OF INSTRUCTIVE EXPERIENCE IN MICHIGAN.

Two diagrams, "Isolation and Disinfection Restrict Diphtheria," and "Isolation and Disinfection Restrict Scarlet Fever," have been prepared,

and many hundreds of them distributed. They exhibit, in a condensed form, the experience of the health officers in Michigan, in 1889, with these two important diseases. The evidence in them is similar to that in similar diagrams which have been published for preceding years.

These diagrams are printed on pages 172 and 209 of this Report.

ABSTRACTS OF PROCEEDINGS OF MEETINGS.

Abstracts and brief accounts of the proceedings at meetings of the State Board of Health are prepared, printed, and distributed soon after the regular meetings of the Board. (Extracts from these abstracts are printed on pages following, in this Report.) The distribution of the pamphlet Proceedings is not the same for all meetings, being to different classes of persons, according to the nature of the contents, in some instances being sent to teachers and school officers, in other instances to health officers, etc.

REPRINTS.

Reprints, of articles in the Report and in Proceedings of Sanitary Conventions, have been made in pamphlet form, and sent in answer to queries, in letters, that can best be answered in that manner. For example, many reprints of the article relative to alleged nuisances in the preceding year, have been thus sent out, in response to questions.

NEGLECT OF DUTY BY LOCAL BOARDS OF HEALTH: CAN A LOCAL BOARD OF HEALTH BE COMPELLED TO APPOINT AND CONSTANTLY HAVE A HEALTH OFFICER?

Occasionally a local board of health fails to maintain a watchful guardianship of the health of the people in its jurisdiction. Most of such cases of neglect result from disobedience of that law which requires every board of health to appoint and constantly have a health officer. If that law is disobeyed, the health of the people is likely to be endangered.

The following correspondence of the Prosecuting Attorney of Kent Co., the Attorney General of the State of Michigan, and the Secretary of the State Board of Health, bears on the subject of compelling reports by physicians to local boards of health, failure of local boards to act when dangerous diseases are reported, failure to appoint a health officer, etc.

A letter dated April 14, 1890, was received from William J. Stuart, Prosecuting Attorney of Kent Co., stating that:—

"An unpleasant state of affairs exists in the township of Byron, in this county, and I am puzzled to know what course is best to pursue to right the difficulty, and write you hoping that your experience

may enable you to point out a way of relief. They seem to be having the diphtheria, and a physician that has attended many of the cases claims that it is not diphtheria but tonsillitis, and he fails to report the cases in due form to the Board of Health. On the other hand, some cases have been reported to the Board of Health, and they have utterly neglected to do anything, until last Saturday. I understand they met and appointed a health officer, who, after investigating the cases, ordered the public school to be closed; but the school officers refused to close it, and ordered the teachers to open it. An application is made to me for a remedy to compel the doctor in charge to report the cases, and to compel the Board of Health to take proper care of the disease, and to help out the health officer in closing the school."

The remaining portion of Mr. Stuart's letter may perhaps be inferred from the reply.

In response to the foregoing letter, the Secretary wrote, April 15, 1892, the following letter:

WILLIAM J. STUART, *Prosecuting Attorney of Kent Co.:*

DEAR SIR:—In response to your letter of yesterday, I regret to say that I think that in at least one of the three violations of law which you detail the law *is* imperfect and does *not* properly protect the public health:

1. I do not see how, under § 1676 Howell's Statutes, Act 11, 1883, you can convict of a criminal offence a physician who is "actually ignorant of the nature of the disease." (There should be a law requiring qualifications of physicians.) And, as you say, the action for the penalty which is, I think, the only one possible, "is virtually of no avail against physicians who are worthless."

"But is it not possible in such cases to reach *householders* under § 1675, Howell's, as amended by Act approved March 28, 1889? By this mail I send you a copy marked to indicate this suggestion. Perhaps you or the health officer could well publish to them their duties?"

2. Yes. "It seems as though there *ought* to be some summary method of protecting the public, during the danger," from the presence of a most dangerous communicable disease like diphtheria, when a local board of health neglects to do what the law requires, and *if it is simply neglect* a summary method *is* provided in Act 137, Laws of 1883, as amended by Act approved March 28, 1889, pages 3 and 4 of pamphlet [120] which I send you by this mail. By that act it is the duty of the *health officer* to do about all that is necessary; and, if he fails (violates section one) he is liable (Sec. 2) to fine and, if not paid, to imprisonment, as is also whoever knowingly violates his orders made in accordance with section one of that act.

"I suppose you have in mind (1706) C. L. § 1647, Howell's; and (1732) C. L. § 1673, Howell's, when you say that, for violations of such provisions, the local board can only be impeached or removed from office.

"3. As to order to close school, if made by the health officer 'in accordance with' section one of Act 137, Laws of 1883, it seems to me that notice of proposed action by you under § 8442, Howell's, and Sec. 2, Act 137, 1883, as amended by Act approved March 28, 1889, would induce the members of the school board to immediately comply with the order of the health officer, and thus avoid fine or contingent imprisonment.

"I shall be glad to hear that prompt action has been taken, and that it results in the usual prompt restriction of this dangerous disease where prompt action is taken; because where prompt action is *not* taken many cases of preventable sickness occur, and sometimes lives are lost, as you will see by a diagram which I send herewith.

"If this office can be of any service in any way it will give us pleasure."

Very respectfully,

HENRY B. BAKER,

Secretary.

April 18, 1890, the following response was received from Mr. Stuart:

"Your esteemed favor of the 15th, in regard to my letter regarding the diphtheria at Byron Center, was duly received, and while it does not call for a reply, I beg to suggest one or two matters, which may aid you in future legislation.

"Under the first head in your letter, after stating that the physician could not be prosecuted where he was ignorant of the offense, you think it was possible that the householder might be reached under section 1675 of Howell's Statutes, as amended by the laws of '89. The probable difficulty would be that they relied upon the advice of the physician that it was not diphtheria or a dangerous disease, and when they have sufficient confidence in a physician to call him in a case of sickness, they ought certainly to be justified in following his advice, as to the nature of the disease.

"Again, under your second head, you seem to think that the Board of Health might be reached for neglect of duty by going for the *health officer;* but suppose, as in many localities, the Board of Health and the health officer are regarded as a new fangled notion, and that filth and dirt conduce to healthfulness, and the Board of Health should neglect to either appoint a health officer or take any steps, as the law requires, in that case the law seems to be powerless to protect the public. Fortunately, in our case, the board has just recently appointed a health officer."

In reply to the foregoing communication from the Prosecuting Attorney of Kent Co., the Secretary, April 19, wrote him as follows:

"DEAR SIR:—Please accept cordial thanks for your letter of April 18. The points you make are good, and have been considered, except your last supposition in which probably I did not make myself clear. I had no thought of reaching the Board of Health 'for neglect of duty by going for the health officer,' but thought in that way to secure *immediate* protection to the public health. I had in mind the fact that your board had recently appointed a health officer.

"I believe very strongly in local self government, and we do not wish to have power, or to be called upon to perform, duties which should be done by local officers. Gradually we are able to increase the efficiency of local officers, and this results in permanant sanitary progress. and we are gradually able to improve the laws through such experiences as you are now having, legislators paying much more attention to the demands of their constituents than to State executive officers, for the improvement of laws governing localities.

"Very Respectfully,

"HENRY B. BAKER, *Secretary.*"

On the subject of the appointment of a health officer, required by law, the Secretary sent the following communication to Hon. Benjamin W. Huston, Attorney General, Lansing, June 3, 1890:

"I understand that the law in this State provides a board of health in every township, city or village; that the cities and villages in which no board of health is actually organized under the charter, the board of health consists of the president and council or trustees of the village, and a mayor and alderman of the city, §1681 Howell's Statutes. The law, §1634 Howell's Statutes, requires that "every Board of Health shall appoint and constantly have a health officer." I believe that there is nothing in the charter of any city or village in the State that conflicts with the general law which requires the appointment of a health officer by the council acting as a board of health, or by a board of health constituted under some charter provision.

"Nearly every city in Michigan complies with this law, as may be seen by the printed list of health officers of cities for the year 1889-90, sent herewith.

"From statistics collected by the State Board of Health, we now know that hundreds of lives are saved in Michigan every year by such work as is required by law to be done by the local health officer. A few cities and villages fail to comply with the law which requires the appointment of a health officer. It is believed that lives may at any time be endangered in those localities by such non-compliance with law. The question which I desire to have your opinion upon is whether there is any legal procedure which shall enforce obedience to this law.

"I have in mind §8442 Howell's Statutes, requiring the Prosecuting Attorney to prosecute for penalties and forfeitures; also §2766 Howell's Statutes. But I am not clear as to the exact method of procedure. The law, §1623 Howell's Statutes, says: 'The State Board of Health shall have the general supervision of the interests of the health and life of the citizens of this State.' In that supervision, the disregard of law by a few cities and villages is observed; and your opinion as to how it may be corrected and improved is respectfully solicited."

In compliance with the foregoing request by the Secretary, the office of the Attorney General rendered an opinion, which is as follows:

Lansing, Mich., June 7, 1890.

HON. HENRY B. BAKER, *Sec. State Board of Health. Lansing, Mich.,*

DEAR SIR:—In reply to your inquiry of the third inst., as to the proceedings to be taken in cases where the Board of Health of a city or village refuses or wilfully neglects to appoint a health officer, will say that I am unable to find any statutory provision imposing any penalty upon the members of the board for such refusal or willful neglect, and the only remedy would be removal. In cases where members of the Board of

Health are chosen by the electors of any city or village they might be removed, for such neglect or refusal, by the Governor, as provided by sections 653 to 656 inclusive, of Howell's Statutes. If the members of the board hold office by appointment the proceedings for removal will be governed by the statute under which the city was incorporated, either the general law or the special charter. In such cases the power of removal ordinarily rests with the officer or board having the power of appointment.

Very truly yours,
B. W. HUSTON,
Att'y. Gen'l.
per. J. P. LEE.
Assistant.

OBITUARY NOTICES OF SANITARIANS.

DEATH OF HON. IRA H. BARTHOLOMEW, M. D., WHO INTRODUCED IN THE LEGISLATURE AND SUCCESSFULLY ADVOCATED THE BILL TO ESTABLISH THE MICHIGAN STATE BOARD OF HEALTH.

The Michigan State Board of Health was estalished in 1873. Dr. Bartholomew had accepted the nomination and became representative of his district in the legislature, for the purpose of securing the passage of a law for the establishment of a State Board of Health, and of other laws for the advancement of the interests of the people in sanitary affairs, one of the chief of which was the law for the inspection of illuminating oils, because up to that time there had been no legal supervision of that subject in Michigan, and many horrible burnings had occurred from the use of dangerous inflammable oil. He was successful in both the above mentioned objects, and served his district with marked ability in many ways. It is probable that he would have been appointed among the first members of the State Board of Health except that, being a member of the legislature, he was therefore not eligible.

Dr. Bartholomew was born in 1828, in Madrid (since Waddington), St. Lawrence Co., N. Y. He graduated at the medical college of the University of Michigan in 1853. He died in Lansing, Michigan, October 18, 1889.

During the early years of the existence of the city of Lansing, and for many years, Dr. Bartholomew was a conspicuous and honored citizen. He served as mayor of the city three times in succession.

The secretary of the Michigan State Board of Health, while president of the American Public Health Association, in 1890, wrote as follows:

"Ira H. Bartholomew, a former member of this Association, died at Lansing, Michigan, October 18, 1889. He was a prominent member of his profession, had been President of the Michigan State Medical Society, and was a close student of social science. As his student, partner, associate and friend I wish to record the fact that (two years after some of us had made an unsuccessful effort) it was due to his efforts, about eighteen years ago, while he was a member of the Michigan State Legislature, that the Michigan State Board of Health was established."

DEATH OF HON. COLUMBUS V. TYLER, M. D., OF BAY CITY, MICHIGAN, MEMBER OF THE MICHIGAN STATE BOARD OF HEALTH FROM JANUARY 12, 1883, TO OCTOBER 27, 1888.

Hon. Columbus V. Tyler, M. D., Senator from the 25th Senatorial District, Michigan, born in Auburn, N. Y., in 1825, member of the Michigan

State Board of Health from January 12, 1883, to October 27, 1888, and State Senator in the Michigan legislature, during the three sessions of 1877, 1879, and 1889, died at his home in Bay City, June 1, 1889.

Upon receipt, at the Office of the State Board of Health of the sad news of the death of the Hon. Columbus V. Tyler, M. D., the Secretary sent a copy of the following communication to each member of the Board:—

MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Michigan, June 3, 1889.

Member of the State Board of Health:

It becomes my painful duty to announce to the members of this Board the death of Hon. C. V. Tyler, M. D., of Bay City, for six years a member of the Board.

The funeral occurs Thursday, June 4, at 4:30 P. M. I shall attend.

Very respectfully,
HENRY B. BAKER,
Secretary.

From the Daily Proceedings of the Michigan State Senate.

The following is abstracted from the daily proceedings of the Michigan State Senate in the "Legislative Journal" of June 3, 1889.

"The President *pro tem.* announced the reception of the following telegram, which the Secretary read:

Bay City, Mich., June 1, 1889.

HON. WM. BALL, *President of the Senate:*

Columbus V. Tyler, Senator twenty-fifth district, died this morning.

F. E. TYLER.

Whereupon Senator Wisner offered the following resolutions:

WHEREAS, The Senate has received with unfeigned regret the announcement of the death of Hon. Columbus V. Tyler, a member of this body, who departed this life at his home in Bay City on Saturday last; therefore

Resolved, That this Senate deplore his decease, as an upright and distinguished member of this body, an honest and devoted servant of the people, faithful to the interests of his constituents, and one who has left a stainless record in the public service.

Resolved, That in his death the Senate and State have lost an able, earnest and conscientious legislator and the people of the twenty-fifth senatorial district a firm and consistent advocate of their important interests.

Resolved, That these resolutions be spread upon the Senate Journal, a copy engrossed and sent to the widow and family of the deceased Senator, with the assurance that this body profoundly sympathize with them in their great bereavement; and

Resolved further, As a mark of respect to our deceased brother, that when the Senate adjourns, it adjourn to meet on Wednesday, the 5th day of June, at 10 o'clock A. M., to give the Senate as a body an opportunity to attend his funeral, which will take place at his home in Bay City at 3 o'clock, P. M. tomorrow.

The question being on the adoption of the resolutions,
Senator Wisner addressed the Senate as follows:

MR. PRESIDENT—For the second time during this session the grim messenger has entered these halls and struck his deadly arrow into the heart of this Senate.

The somber emblems of mourning that a few days ago palled the canopy above your head have scarcely been removed ere kind hands are busy draping another chair with evidences of a people's grief. First a Lieutenant Governor, a chosen leader of his party, placed in position by a majority of the people of this great State, lays down his armor and falls before the only foe he could not meet. Now a Senator, in the prime of his maturity, in the full power of his grand intellectual strength, whose ability and moral worth made him the chosen leader of one hundred thousand people, is stricken down

Mr. President, this is no time to moralize upon the wisdom and inscrutability of natural laws that alike affect the monarch and the serf, the President and the lowest of his appointees, the elected and the elector. Let us rather gather from this a lesson that each and every one of us should so perform our duty that, when the change shall come, willing hands and kind hearts will scatter flowers along the pathway imprinted by sorrowing feet as they convey us to the tomb.

Thirty-nine years ago, in the month of July, I first met Columbus V. Tyler. From that time when I, as a farmer boy, sought his advice, the cords of friendship and affection have been strengthened by each succeeding year, only to be strained, but, thank God, not severed, by the fatality of Saturday last. He had stuck his shingle in an obscure town in my county, as a disciple of Esculapius; I had adopted as my patron saint the legal maxims of Lycurgus, both grand and heroic men, the production of a grand and heroic age. From that time for twenty years we were intimate friends. He succeeded in his profession. I obtained mediocrity in mine. But his encouragement and his advice, like a gleaming star at midnight, shone out to guide my footsteps and lead me on my perilous way. In 1869 he removed to Bay City. In 1863 I left the county where we had both resided so long, and came to Saginaw, where we frequently met. He had risen to the topmost round in his profession, and I will not at this time detain the Senate by enumerating the public positions he filled with honor to his constituents and credit to himself. Three times elected to this Senate by a constituency at once as cultured and enterprising as any in Michigan, is the best testimonial I can offer to his popularity and worth. As a citizen, public spirited; as a physician, honest and upright, whether in consultation or at the bedside of the dying. As a public officer, incorruptible and faithful to his trust; in his domestic life a kind husband and affectionate father; as a friend of humanity, faithful in every good word and work. And tomorrow, as we deposit his remains in the midst of the people he loved so well, the beating hearts and moistened eyes of hundreds of his friends of a lifetime will be better than any tribute I can pay to his memory. In politics, he was a Democrat. A Democrat by birth, observation, education, and conviction. He always struck an enemy above the belt, and never in his whole political life resorted to the base acts of the party trickster. Honor was his guiding star; and like a brave soldier he always held his canteen to the lips of a wounded and fallen foe. His partisanship always secured the respect of his political opponents.

Mr. President, it was a beautiful and sublime conception of Moore, clothed in poetic language, that when the Peri desired to enter Paradise she brought many noble gifts to propitiate the guardians of heaven. She brought the dying sigh of a patriot whose life-blood reddened the soil of liberty for which he fought. But the gates remained barred by angels' wings. She brought the kiss of a maiden imprinted upon the cheek of her lover, distorted with the venom of the plague. But angelic hosts refused her summons. Weary and discouraged she returned to earth, and with outspread pinions presented at heaven's gate the aspirations and life of one who spent his days in acts of charity and noble deeds, to benefit and elevate the condition of his fellow man, and the gates of heaven flew open at her behest. Let us believe that with such an offering, embracing the record of a life, some angel will leave the gates ajar as our Senator and brother passes through them to an angel's home.

Senator Gorman then addressed the Senate (but without notes), speaking feelingly of the last illness of the deceased Senator, his deep interest in every detail of the Senate's work, his conscientious earnestness in all that pertained to the welfare of the State, and the anxiety he evinced, even to the last, for the performance of the duties which devolved upon him as a Senator but which he was fated never to discharge.

The question then being on the adoption of the resolutions,

The resolutions were unanimously adopted by a rising vote.

Mr. Ranney moved that Senators Wisner and Gorman be requested to furnish for publication in the Senate Journal the manuscript of their remarks.

Which motion prevailed.

Mr. Colgrove then moved that, as a further mark of respect to the memory of the deceased Senator, the Senate now adjourn.

Which motion prevailed.

The President *pro tem.* announced that the Senate would stand adjourned until Wednesday, June 5, 1889, at 10 o'clock A. M.

From the Daily Proceedings of the Michigan State House of Representatives.

The following is abstracted from the daily proceedings of the Michigan State House of Representatives in the "Legislative Journal" of June 3, 1889.

By unanimous consent:

Mr. Briske offered the following:

WHEREAS, Intelligence is received with deep regret of the death of the Hon. Columbus V. Tyler, Senator from the 25th District of Michigan, serving his third term in the Michigan Legislature; therefore be it

Resolved, That this House deplores his decease as that of a distinguished gentleman, an honest and devoted servant of the people, who left a stainless record in the public service.

Resolved, While his long illness has prevented much of his attendance during the present session, still in his death we recognize the State has lost an able, earnest, sincere, conscientious legislator and public servant, an upright and Christian gentleman, whose good influences are now forever stilled.

Resolved, That these resolutions be spread upon the Journal, and as a further mark of respect and sympathy of this body, the Speaker appoint a committee of six to attend the funeral from the late Senator's residence at Bay City, at 3 P. M. tomorrow.

Which was adopted by an unanimous rising vote.

The Speaker announced as the committee under the resolutions, Messrs. Briske, Curtis, W. W. Williams, N. J. Brown, Eaton and Randall.

On motion of Mr. Baker,

The Sergeant-at-Arms was instructed to accompany the committee, and to procure suitable badges for the occasion.

The funeral services of the late Doctor Columbus V. Tyler, of Bay City, Michigan, were held at his residence in that city. A special train, from Lansing, conveyed the Honorable State Senate, a Committee from the House of Representatives, State Officers, Physicians, and other sympathizing citizens of Lansing to the funeral exercises of their deceased friend and brother. The house was filled with friends of the family and representatives of the Medical Profession. The pall-bearers were prominent members of the Medical Profession. The remains were interred in the city cemetery.

DEATH OF SIR EDWIN CHADWICK, IN ENGLAND.

During the fiscal year, sanitary reform has lost an able advocate in the death of Sir Edwin Chadwick in England. The British Medical Journal, the organ of the British Medical Association, had this to say of his eminent services to humanity:—

"Few men have deserved better of their country than the veteran sanitarian whose death, at the advanced age of ninety-one, we have to record. His investigations of the sanitary condition of London, dating back to 1847, were the official starting-point of a re-organization of the Health Department, and laid the public legislative basis of the first of a series of sanitary reforms, which have been of inestimable value during the last half century in the saving of life and diminution of sickness and disablement. His subsequent services to the cause of army health reform, and his continuous devotion to great and small questions of public and personal sanitation, placed him quite in the first rank of non-medical sanitary reformers." . . . "It has been aptly observed that had he, as a military man, succeeded in destroying one hundredth part of the lives which he was

prominent in assisting to save, his statue would have been erected long since in more than one of the great cities of the empire, and he would have been loaded with honors and titles. As it is, it was not until he attained the age of ninety that he received the honor of knighthood." *

ATTEMPTED REMOVAL OF THE OFFICE OF THE STATE BOARD OF HEALTH.

In August, 1889, it was rumored among the janitors in the Capitol, that the State Board of Health was to be displaced from its offices in the Capitol to make room for the newly created Bank Commissioner's office. Accordingly, August 5, the Secretary of the State Board of Health sent to each member of the Board of State Auditors a telegram as follows:

"HON. ROSCOE D. DIX, *Berrien Springs, Mich.:*

"Under any circumstances do you think of displacing State Board of Health office from Capitol building? Kindly reply promptly as action depends.

"HENRY B. BAKER, *Seretary.*"

No response was received from Mr. Dix, but replies were received from Mr. Osmun and Mr. Maltz, the latter saying, "Yes; think that will be action of board."

Later the secretary of the State Board of Health sent a communication to the Board of State Auditors in session, in which he said: "I respectfully request your Board at least to delay taking such action until facts and objections may be placed before you by members of the State Board of Health and others interested in public health." The Secretary also mentioned reasons why the proposed removal should not occur. Dr. Avery, the President of the State Board of Health, in a letter dated Aug. 6, protested against the proposed removal. Other protests were made; Sept. 9, a letter was sent, by the Secretary, to the Board of State Auditors; it may be found in the proceedings of that meeting; but, subsequently, the clerk of the Board of Auditors notified the Secretary of the State Board of Health, that the Board of State Auditors had assigned the rooms occupied by the State Board of Health to the Commissioner of the State Banking Department.

The Secretary of the State Board of Health appealed to the Attorney General, who is the legal advisor of the Board of State Auditors; and also put the subject before the Governor. The several laws, publications, letters, etc., referred to in the statements of law and facts, to the Governor and Attorney General, were placed in the hands of the Attorney General. The statement was substantially as follows:—(The proposed removal was not consummated.)

THE LAW CONCERNING THE OCCUPANCY OF ROOMS IN THE STATE CAPITOL.

There is nothing on this subject in the constitution. Referring to the Board of State Auditors, "The Constitution itself has vested this Board with but two functions—one, that of determining and adjusting claims against the State—the other, that of canvassing votes for certain officers." †

* British Medical Jour., No. 1541, July 12th, 1890, p. 96.
† Howell's Statutes, p. 163, Footnote 307.

There seems to be no statute law on this subject except Sec. 15 of Act. 67, Laws of 1871, from which the inference seems plain that the intention of the legislature that ordered the building of the State Capitol was to supply rooms for the use of the legislature, and office room for the State offices then established by law and specified in the act, "and such other rooms and offices as may be deemed essential and necessary." And at the time of the passage of that act there were bills before the legislature for the establishment of an Insurance Bureau and a State Board of Health. The Insurance Bureau was created by the same legislature that ordered the building of the Capitol, the bill for the State Board of Health did not then pass, but the Board was established by the next legislature. As regards the State Board of Health, the law (Act 81, Laws of 1873) said the office should be at Lansing:—"Sec. 11. The Secretary of State shall provide a suitable room for the meetings of the Board at Lansing, and office room for its Secretary." Up to the time when the new Capitol was completed, this was done,—the State Board of Health met in the private office of the Secretary of State, and the Secretary occupied a desk in the general office of the Secretary of State.

While the general plans for the Capitol were being considered by the Board of State Building Commissioners, and before the plans by architects were asked for, consideration was given to the prospective uses of the several rooms, in accordance with Sec. 10, of Act 67, Laws of 1871, consultation with the State officers and commissioners having been held as recorded on page 3 of the first Annual Report of the State Building Commissioners; and in their "Instructions to Architects" the Commissioners specified the numbers and sizes of rooms for each of the several state officers, and for the Insurance Bureau, and also for an "extra Department." At the time the law was passed the only "extra department," aside from the Insurance Bureau, that was before the legislature, was the proposed State Board of Health, the bill therefor having been introduced by Senator Cravath. It may be mentioned, in passing, that the sizes of the rooms which, since the completion of the Capitol, have been occupied by the office of the State Board of Health, correspond somewhat nearly with the sizes specified in the "Instructions to Architects" by the Board of State Building Commissioners.

Furthermore, according to a recent letter to Dr. Baker, Secretary of the State Board of Health, the recollection of Ex-Governor Henry P. Baldwin, the Governor who recommended the building of the Capitol, the one who was the first chairman of the Board of State Building Commissioners, is to the effect that in said "Instructions to architects" the Commissioners had in mind the possible needs of the State Board of Health for "other rooms and offices as may be deemed essential and necessary" as required in the law for the building of the Capitol.

As showing the interpretation of the law by the Governor at the time the corner stone of the Capitol was laid, Governor Bagley said "We have assembled for the purpose of laying the corner stone of the new Capitol building, worthy of our State; a fitting *home* * for different branches of its Government." There was, apparently, no intention of having offices disturbed by moving about. There is no law which hints at such a procedure. Just before the building passed out of the hands of the Building Commissioners (and was accepted by the Governor) more commodious rooms were agreed upon for the use of the Insurance Bureau; and the Board of State

* Italicised in quoting.

Auditors (room for which office was not mentioned in the act for the erection of the Capitol) took possession of the room now occupied by it. It has been suggested that this, and a compliance with other alleged action by the Board of State Auditors, has built up a "custom" or "usage" which gives the Board of Auditors power to move a State Officer out of his office, and out of the Capitol building, even into a building which the Auditors are by law authorized to sell. But it does not seem possible that this can be true. Because it seems to be a well-settled principle in law that nothing can become "usage" which is detrimental to public policy. And certainly it is against public policy to so seriously interfere with the work of a public office, in the intervals of legislative sessions, as to repuire it to move, on the order of a State Board, without even asking the approval of the chief executive of the State. That would interfere with the working of any State Department. Some of the reasons why it would interfere with the work of the State Board of Health may be mentioned, as follows:

The State Board of Health office has need for frequent communication with the other offices in the Capitol, and with the State Library. The office has received large numbers of manuscript reports, the compilation of which for certain purposes has not exhausted their great usefulness for other purposes for which they will be very valuable, if the continuous series are unbroken, but removing will be likely to disarrange them, and practically to lose manuscripts which would make breaks in the series.

The Board of State Auditors and the Governor were by law (Act 148, 1877) authorized to purchase furniture for the new Capitol. Before the dedication of the Capitol, the State Board of Health asked the committee, appointed for that purpose, to have the furniture prepared for it in the rooms which the Board now occupy. Members of the Board of State Auditors demurred, and proposed that rooms since occupied by the State Department be furnished instead. Finally, however, the rooms asked for were furnished.

In the Act (No. 205, Laws of 1877) which, by the way, does not require the *Auditors* to provide rooms in the Capitol for the Bank Department, but says, "There shall be assigned suitable rooms in the State Capitol for conducting the business of said Department," it does not seem probable that it was the intention of the legislature to legislate the State Board of Health out of the rooms it has occupied since the building was constructed, and rooms which there is reason to believe were planned and constructed for its offices. There is nothing in the title of the act which can be construed to cover such an object. The constitution, Sec. 20, says: "No law shall embrace more than one object, which shall be expressed in its title." It would seem certain that the most suitable rooms not previously assigned in accordance with law were to be assigned to the Bank Department *by the legal custodian of the Capitol.* And it may be remarked that there *are* rooms which have been declared by competent authority to be "Suitable" at least for the present, and which until the next session of the legislature at least will be unoccupied unless thus assigned.

Who is the legal custodian of the Capitol?

I can find no law or good ground for a belief that this responsibility rests upon the Board of State Auditors. It is true that the Board, more especially in recent years, has shown a disposition to assume that responsibility; but the history of the Capitol seems to prove that it is pure

assumption, the responsibility having been in fact publicly and solemnly devolved by legal process upon the Governor of the State. I well remember the impressive occasion at the "Inaugural" exercises at the new Capitol of Michigan, at its dedication, Jan. 1, 1879, when in the presence of the State Officers, including the Judges of the Supreme Court, members and ex-members of the legislature, and a large assemblage of citizens, the Chairman of the Board of State Building Comissioners "Appointed and Commissioned to erect and to complete a building suitable for the State Capitol," formally presented the "Edifice with all its appointments" to the Governor of Michigan; and the Governor responded: "In behalf of the State it gives me great pleasure to accept the Capitol Building." *

I cannot find that there has been a transference of this great responsibility from the Governor to the Board of State Auditors. I respectfully submit that a trust of such magnitude, accepted from competent authority, † under such circumstances, by the highest officer of the State, should not be assumed by other officers than those in direct succession, unless by the express will of the people.

It would seem then, that the Governor of Michigan is entrusted with the "Edifice and all its appointments," and that, so far as the will of the people has yet been expressed, it is to the effect that he holds the Capitol in trust *for the uses for which it was designed*, namely, "for the use and occupation of the various State Departments, including legislative halls, committee rooms, executive offices, State library, room for the Supreme, Court, Attorney General, and rooms and offices for the Secretary of State, Auditor General, State Treasurer, Commissioner of the State Land Office, and the Superintendent of Public Instruction, and such other rooms and offices as may be deemed essential and necessary ‡," including rooms for the State Board of Health—such rooms having been, in fact, heretofore properly assigned in accordance with law.

HENRY B. BAKER.

SICKNESS CAUSED BY SMOKE IN THE ATMOSPHERE.

About October 23, 1889, a few hundred copies of the following were hektographed and sent out to a number of newspapers throughout Michigan, and with the weekly bulletin for the week ending Oct. 26, 1889, and with the monthly bulletin for the month of October. The article asked public attention to a cause of sickness which is largely preventable, but which is permitted to prevail nearly every autumn, and sometimes in villages in the spring, by reason of carelessness in burning rubbish. The article was as follows:—

ONE CAUSE OF SICKNESS AND DISCOMFORT LARGELY PREVENTABLE.

Owing to the drouth fires, especially in swampy places, are numerous, and the atmosphere is unusually smoky and irritating to the eyes, head and air-passages. Some diseases

* Inaugural Exercises at the Dedication of the New Capitol, p. 47.
† The State Board of Building Commissioners appointed and commissioned by law, Act 67, Laws of 1871.
‡ Act 67, Laws of 1871, p. 86.

are aggravated, * sleeplessness, nervous disturbance, general discomfort, and, I believe other serious troubles not commonly recognized as due to this cause, result, because the atmosphere is to a considerable extent unfitted to properly sustain life. One apparent change in the atmosphere is to lessen, below the normal limit, the active oxygen; and this is especially true during the nights; thus, during the week ending Oct. 19, no ozone whatever could be detected in the atmosphere at Lansing on any night except one—Wednesday. A sense of want of air,—even approaching suffocation, and a weakness of the circulation, in some approaching heart failure, has been noticed.

The object of this note is to ask attention to the fact that much of this discomfort and danger to health could easily be prevented if all persons would refrain from setting fire to rubbish, until after this bad condition of the atmosphere has passed. On many evenings dozens of such fires have been set in one small city in the interior of this State. As "the wind goes down with the sun" nearly all the irritating smoke and bad air from such fires built in the evening remain in the city or village, and must be breathed by the inhabitants.

If such fires be made, it would be very much better to build them in the morning, because the movement of the atmosphere then usually increases until 2 p. m., and that may carry the foul and irritating air from such burning rubbish outside the city or village.

HENRY B. BAKER,
Secretary.

Office of the State Board of Health, Lansing, Mich., Oct. 23, 1889.

LEPROSY.

CORRESPONDENCE RELATIVE TO THE PREVENTION OF ITS INTRODUCTION.

CALIFORNIA STATE BOARD OF HEALTH,
Sacramento, January 13, 1890.

DEAR SIR:—*At a regular meeting of the State Board of Health of the State of California, held January 11, 1890, it was:*

"*Resolved*, That the California State Board of Health recommend that the Congress of the United States do enact a statute,

"*First*, That no person affected with leprosy should be permitted to enter the United States;

"*Second*, That every person immigrating to the United States from any place where leprosy prevails shall procure a certificate from a competent physician, properly attested by some United States Consul or Health Officer, certifying that he or she is not affected with leprosy, is not a descendent from a leprous family, and has no relations in the co lateral line who are lepers;

"*Third*, That every immigrant coming to the United States who has sojourned or resided where leprosy prevails shall be reported to the Board of Health of the State of his destination, so that he may, during his residence in the United States, be inspected not less than twice each year by some competent physician or person appointed by the health authorities of the place wherein he resides for a period of ten years;

"*Fourth*, That the penalty for the violation of the first two sections of this statute shall be the immediate return of such person to the place from whence he or she came.

"*Resolved*, That the California Representatives in Congress be and they are hereby earnestly requested to vote for the enactment of such a statute, and that the Secretary of this Board be instructed to furnish said Congressmen a copy of these resolutions, duly signed by the President and attested by the Secretary."

HENRY S. ORME, M. D.,
President.

G. G. TYRELL, M. D.,
Secretary.

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* During the week ending Oct. 19, tonsillitis increased 50 per cent, pleuritis 33 per cent, inflammation of the brain 25 per cent, and membranous croup 26 per cent. Probably other causes than the one here mentioned had influence, but the other atmospheric conditions were not such as to account for such increase.

TREASURY DEPARTMENT,
OFFICE OF THE SUPERVISING SURGEON-GENERAL,
U. S. MARINE-HOSPITAL SERVICE,
Washington, January 16, 1890.

Secretary, State Board of Health, Lansing, Mich.:

SIR:—I have the honor to enclose herewith a circular containing regulations to prevent the introduction of leprosy into the United States; and, for the surveillance of the northern frontier, would suggest the coöperation of your board.

By the provision in Section 5 of the Act of Congress approved April 29th, 1878—local inspectors may be designated as United States Inspectors and clothed with the authority of the latter. If you will submit to this bureau the names of inspectors appointed by authority of your board—their appointment as United States Inspectors will be forwarded. No compensation, however can be granted for their services by this bureau, but as state health officers it is suggested they could charge inspection fees, by which the expenses of the inspection service could be defrayed.

Respectfully yours,
JOHN B. HAMILTON,
Supervising Surgeon-General, M. H. S.

CIRCULAR.

REGULATION TO PREVENT THE INTRODUCTION OF LEPROSY.

1889.
Department No. 130.

TREASURY DEPARTMENT,
OFFICE SUPERVISING SURGEON-GENERAL,
MARINE-HOSPITAL SERVICE,
Washington, D. C., December 23, 1889.

To the Medical Officers of the Marine-Hospital Service, Collectors of Customs, and others concerned:

The national quarantine act, approved April 29, 1878, entitled "An act to prevent the introduction of contagious or infectious diseases," provides that no vessel or vehicle coming from any foreign port or country where any contagious or infectious disease exists, or any vessel or vehicle conveying persons or animals affected with any contagious disease, shall enter any port of the United States, or cross the boundary line between the United States and any foreign country, except in such manner as may be prescribed.

Attention is now directed to the increased prevalence of the contagious disease known as leprosy in several foreign countries, and the danger of its increase in the United States through the immigration of persons affected with leprosy, and by direction of the Secretary of the Treasury the following regulation is framed under authority of the foregoing act, subject to the approval of the President, to protect the people of the United States from the introduction of leprosy:

1. Until further orders, no vessel shall be admitted to entry by any officer of the customs until the master, owner, or authorized agent of the vessel shall produce a certificate from the health officer or quarantine officer at the port of entry, or nearest United States quarantine officer, that no person affected with leprosy was on board the said vessel when admitted to free pratique, or in case a leper was found on board such vessel that he or she with his baggage has been removed from the vessel and detained at the quarantine station.

2. Medical officers in command of United States quarantines are hereby instructed to detain any person affected with leprosy found on board any vessel, but such officer will permit the departure on out-going vessels of persons detained at quarantine in pursuance to this regulation, provided such vessel shall be bound to the foreign country from which the said leper shall have last sailed.

JOHN B. HAMILTON,
Supervising Surgeon-General, Marine Hospital Service.

Approved:
WILLIAM WINDOM, *Secretary.*

Approved:
BENJ. HARRISON.

Lansing, Michigan, Jan. 3, 1890.

DR. JOHN B. HAMILTON, *Supervising Surgeon-General, M. H. S.*

DEAR SIR:—Please accept thanks for your letter of Jan. 16, with enclosure—"Regulation to prevent the Introduction of Leprosy."

I am not clear as to how as "State health officers, they could charge inspection fees, by which the expenses of the inspection service could be defrayed." If that part were made certain, it is quite possible that this Board would be glad to adopt the suggestions of your letter. But the next regular meeting of this Board does not occur until the second Tuesday in April. At that time I shall be pleased to place the communication before the Board for its action. Meanwhile if it is convenient for you to refer me to any law, or decision by the United States Courts, which would imply the right of the State health inspectors to "charge inspection fees" I shall be very thankful.

Very respectfully,
HENRY B. BAKER,
Secretary.

TREASURY DEPARTMENT,
OFFICE OF THE SUPERVISING SURGEON-GENERAL,
U. S. MARINE-HOSPITAL SERVICE.
Washington, Jan. 31, 1890.

HENRY B. BAKER, M. D., *Secretary Michigan State Board of Health, Lansing, Michigan.*

MY DEAR SIR:—I have your letter of the 23d of January, and have to say that there is no United States Statute governing fees of State officers, but there is permissive legislation, and quarantine laws of any State are necessary to provide for the fees of inspectors. The inspection fees of health officers on the seaboard are constantly collected by State officers under local laws. These inspection fees are not *per capita*, but simply a fee for the inspection of the vessel or vehicle coming from a foreign country.

I do not know if an inspection fee has ever been charged a railroad train, and I doubt if there is any precedent for this charge. In the matter of vessels, it has been the usual practice.

Respectfully yours,
JOHN B. HAMILTON,
Supervising Surgeon General, M. H. S.

Lansing, Michigan, Jan. 25, 1890.

H. R. MILLS, M. D., *Port Huron, Michigan.*

DEAR DOCTOR:—I enclose herewith circulars received from the Marine Hospital Service. I should be glad to receive any suggestions which you may have to offer. I have sent a copy to each member of this Board. Our Board will not meet in *regular* meeting until the second Tuesday in April.

Very respectfully,
HENRY B. BAKER, *Secretary.*

Lansing, Michigan, Jan. 25, 1890.

S. P. DUFFIELD, M. D., *Health Officer, Detroit, Michigan.*

DEAR DOCTOR:—I enclose herewith circulars received from the Marine Hospital Service. I should be glad to receive any suggestions which you may have to make. I have sent a copy to each member of this Board. Our Board will not meet in *regular* meeting until the second Tuesday in April.

Very respectfully,
HENRY B. BAKER, *Secretary.*

The following two paragraphs are extracted from the *Detroit Tribune*, Feb. 5, 1890:—

"A paper written by Henry B. Baker of Washington [Lansing] regarding the possible introduction into the United States of leprosy was listened to by Drs. Brodie and Kline and Controller Rush with attention.

"The suggestion that the local inspectors be made United States officers may be a very good one" said Dr. Brodie, "where the place is an exposed seaport town, but I think the Detroit Board of Health can take care of any such cases, and I recommend that the Secretary be instructed to inform Dr. Baker that the health officer at Detroit will take care of any cases that may come this way."

H. R. MILLS, M. D., *Lapeer Avenue,*
Port Huron, Mich., January 28, 1890.

DR. H. B. BAKER, *Secretary State Board of Health, Lansing, Michigan.*

MY DEAR DOCTOR:—Your communication of the 25th. inst. was duly received and contents noted. I am not posted as to the number of cases of leprosy annually imported into this country, and hence do not fully understand how much necessity there may be for an inspection such as is under contemplation by the authorities of the Government. As to the number of immigrants arriving and entering this port there were

In 1887	32,928	transatlantic.
In 1888	38,873	" "
In 1889	31,098	" "

Of these, two-thirds, or about that, are Scandinavians, one-sixth Germans and Dutch and the other one-sixth is made up of Irish, English, French, Italians.

Since the opening of the Canada Pacific Railroad to the "Soo," from Montreal, a large number of immigrants from the northwest come into this country at that port. Hence we do not get quite as many here as formerly.

If I can be of any service to you in any way, please let me know.

Very truly yours,
H. R. MILLS.

REPORT OF THE WATER SUPPLY OF THREE RIVERS, MICHIGAN.

Lansing, Mich., May 9, 1890.

To Mr. L. A. Aspinwall, President of the Village of Three Rivers, Mich.:

DEAR SIR:—By request of officers of your village I visited Three Rivers, and looked over the site, and the surroundings of the present and proposed public water-supplies, with the view of judging of the probable safety of the use of the water for drinking purposes at the present time, and of estimating the chances of safety in the future.

We do not now consider that there is any single test or combined tests, chemical or biological, which when applied to a sample of ordinary water will inform us with certainty whether or not water from the same apparent source will be free from any disease-producing substance; but chemical and biological tests yield valuable information upon which to base an opinion of the present condition of the water; and careful examination and consideration of the facts relative to the surroundings, by one who has thoroughly studied the methods by which disease-producing substances usually enter water-supplies, will, frequently, enable one to estimate the probabilities of the future contamination of the water.

Judging from the analysis, made by Dr. Kedzie, of the water flowing from the tube recently driven at Three Rivers, and from the appearance of the water, its taste, lack of odor, etc., and considering that it comes from a depth of over one hundred feet, and therefore is not likely to be contaminated by water from surface springs, my opinion is that the water from that source is now good and safe for drinking purposes, that, in fact, it is an excellent water.

Judging from the foregoing, taken in connection with the results of my examination and of the surrounding conditions of the surface as far as I could see, and from what I could learn of what had been found under the surface of the ground, my opinion is that water which *will flow* from tubes coming from over one hundred feet below the surface of the ground in the

immediate vicinity of the tube mentioned above will be likely to continue to be good, safe water to use.

In this last proposition I emphasize the words "will flow" for the reason that if it shall be found after pumping from such tubes, in a time of drouth or at any time, that *the level of the ground water in the immediate vicinity is lowered* so that from the springs along the bank near by there is no longer a flowing of water at or near the surface of the ground and past these tubes, I should consider *that* evidence of there being danger of the contamination of the proposed water-supply; because I believe that the water which comes out at these springs has descended as rain on the wide plain (Johnny-cake prairie) and distant hills and in its passage to the springs has had opportunity to receive the leachings from privies near quite a number of residences, at any one of which there may sometime be a case of typhoid fever or some other disease capable of being spread by leaching of contents of a privy into the water-supply. (It is well to bear in mind the difference in results where such cause of disease finds it way into a *private well* in which case only a few are made sick, and into a *general water-supply of the village* in which case hundreds or even thousands may be made sick.)

Considering, as I do, that there is probably a general and constant movement of the water in the ground (down to a depth near the level of the pond and river) the movement being from the distant hills, and a few feet under the surface of the wide plain (Johnny-cake prairie?) toward the pond and river I think that a shallow well near the pond or river, would not be a safe source for a water-supply, even if analysis proves the water to be now free from organic matter; because of the liability of some privy in the course of the constant general current toward the river, contributing at some future time the unseen cause of typhoid fever.

For reasons some of which are stated below, and because of the general movement, which I suppose to exist, of the ground water near the surface, and which I think carries toward the river leachings from privies near residences on the prairie, it seems to me that so far as safety in the use of the water is concerned, it would be better to have the water-works or at least the tubes which go down to the deep water-bearing stratum, put down on the plain, outside the residence portion; but even in that locality I would not approve of taking a general water-supply from a shallow well, especially not where the surface soil is so sandy as it is there and offers so little resistance to the passage of disease-producing substances. I understand that in the locality of the present water-works, water power is available for pumping, and the quantity of rainfall upon the plain is so great that perhaps there is little probability of the level of the ground water being greatly lowered by the quantity pumped for the village; but as sooner or later the iron tubes will rust, and may take in water from a level higher than when first put down, and as, being out of sight, that occurrence could not well be detected, these points are worthy of consideration in deciding upon a location for the permanent water-works. It must be apparent, also, that if situated on the plain, between the hills and residences, the deep wells would be less likely than if situated near the pond to receive water which had filtered through from the pond. If the tube-wells are near the pond, and water filters from the pond *rapidly*, the underground filter-bed will soon become foul, and if it does it cannot be cleaned, and the tendency will be "from bad to worse." My belief is that the water flowing from the tube while I was there did *not* come from the pond; but no

person knows just where it all comes from, and I think it well to guard against a possible fouling of a stratum of earth between the pond and the bottom of a tube-well relied upon to supply pure and wholesome water.

I suppose it is not certain that it is practicable to take water from a deep source by means of tube-wells on the prairie ; but it seems to me desirable to do so if it is practicable.

I was very glad to see that the officers and people of your village are giving so much attention to the subject of a safe water-supply, and I earnestly join in the hope that you will be successful in the attempt.

Thanking you and the other officers who so courteously aided my investigations, I remain

Very respectfully,

HENRY B. BAKER, *Secretary.*

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING JUNE 30, 1890.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—In compliance with Section 5 of Article II. of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the Board, which has been received, issued, expended and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted:

My last report is printed on pages xiii-xxxi of the Annual Report for the year 1889.

INSTRUMENTS PURCHASED SINCE LAST REPORT.

Meteorological instruments have been purchased during the fiscal year ending June 30, 1890, as follows:

3 Maximum registering thermometers (latest pattern).

3 Minimum registering thermometers (latest pattern).

Meteorological instruments have been intrusted to observers during the fiscal year ending June 30, 1890, as follows:

One maximum and one minimum registering thermometer to James D. Munson, M. D., Traverse City.

One maximum registering thermometer (to replace one accidentally broken while in use) to J. W. Ewing, Alma.

One barometer with hook and box; one dry-bulb thermometer, with board and clips; one wet-bulb thermometer, with cup and wick; one maximum registering thermometer, with screw-bolt and pin; one minimum registering thermometer, with board and clips; one raingange; one measuring stick for rain gauge; to Dr. W. C. Gates, Rockland.

The barometer, standard barometer, maximum and minimum registering thermometers, psychrometer, raingauge and measuring stick in care of Milton Chase, at Otsego, were transferred to C. H. Prentiss Otsego, on January 15, 1890. A maximum registering thermometer was sent to C. H. Prentiss, February 28, 1890, to replace one accidentally broken by him February 23, 1890.

Meteorological instruments remaining on hand June 30, 1890:

126 sheets ozone test-paper.

1 skein of psychrometer wick.

2 standard barometers.

1 psychrometer complete.

9 wet-bulb thermometers.

9 dry-bulb thermometers.

4 minimum registering thermometers.

3 maximum registering thermometers.

1 dry-bulb thermometer, 3 minimum registering thermometers, 1 maximum registering thermometer disabled.

4 psychrometer cups, spoiled by rust and long exposure.
18 broken thermometers. (Includes all since observations have been taken.)
2 psychrometer boards, broken.
4 registering thermometer boards, with clips.
6 psychrometer boards, with clips.
8 thermometer clips.
9 psychrometer cups.
1 anemometer spindle.
7 screw-bolts, and pins for registering thermometers.
2 caps for overflow tubes to raingauges.
2 raingauges.
1 basin for raingauge.
4 boxes for hanging barometers in.
2 large galvanized pails to measure snowfall.
1 oil-tester thermometer.
1 standard instrument for inspecting oils.

ACCESSIONS TO THE LIBRARY.

Books and other publications have been received and placed in the library of the board (during the fiscal year ending June 20, 1890) as follows:

BY GIFT, EXCHANGE, ETC. (*Names and addresses of donors being printed in italics.*)

Abbott, Samuel W., M. D., Boston, Mass:—
Forty-seventh Registration Rep. of Mass. for the year 1888.

Angell, James B., LL. D., Ann Arbor, Mich.:—
Calendar of the University of Michigan for 1889-90.

Ashmun, G. C., M. D., Cleveland, Ohio:—
Seventeenth Ann. Rep. of the Health Depart. of the City of Cleveland, year ending Dec. 31, 1889.

Astrononomer Royal, Greenwich, England:—
Results of the Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, in the year 1887.

Atkinson, I. E., M. D., Baltimore, Md:—
Forms of Typhoid Fever Simulating Remittant Malarial Fever.

Australian Health Society, Melbourne, Australia:—
Health Lectures for the People.
Fourteenth Ann. Report of the Australian Health Society, 1888-9.

Babyhood Publishing Co., New York City, N. Y.:—
Nursery Health Facts: No. 1, Scarlet Fever; No. 2 Diet for the Young; No. 3, Diphtheria; No. 4, Sound Teeth for Children.

Baker, Henry B., M. D., Lansing, Mich.:—
A Plea for Public Health in Villages—Henry B. Baker.
The Climatic Causation of Consumption—Henry B. Baker.
Diagram and tables illustrative of "Typhoid Fever and Low Water in Wells."

Baker, M. N., Ph. B., Tribune Building, N. Y. City:—
The Manual of American Water-Works.

Balch, Lewis, M. D., Albany, N. Y.:—
Ninth Ann. Rep. of the State B'd of Health of N. Y.
Local Health Service of the State of N. Y.

Barwick, Sergt. James A., Sacramento, Cal:—
Annual Meteorological Review of the State of California, for the year 1889.

Becker, Dr. K., Berlin, Germany:—
Statistiches Jahrbuch für das Deutsche Reich. Zehnter Jahrgang 1889.
Monatschefte zur Statistik des Deutchen Reichs Jahrgang 1889, November Heft.
Veröffentlichungen des Statischen Amts der Staadt Berlin 1888. Supplement I.
Monathefte zur Statistik des Deutschen Reichs. Jahrgang 1888. Dezember Heft.

Beidenkap, Dr., Christiania, Norway:—
Beretning om Folkemaengden og Sundhedstilstanden i Christiania i Aaret 1888.

Bishop, James, Trenton, N. J.:—
Eleventh Ann. Rep. of the Bureau of Statistics of Labor and Industries of N. J. for the year ending Oct. 31, 1888.

Board of Health, Fall River, Mass.:—
Twelfth Ann. Rep. of the Board of Health of the City of Fall River, year ending Dec. 31, 1889.

Board of Health, Knoxville, Tenn.:—
Sixteenth Ann. Rep. of the Sec. of the B'd of Health and Registrar of Vital Statistics of the City of Knoxville, Tenn., for 1889.

Board of Health, Manchester, N. H.:—
Ann. Rep. of the B'd of Health of the City of Manchester, N. H., for the fiscal year ending Dec. 31, 1889.

Board of Health of the City of Memphis, S. C.:—
Eleventh Ann. Rep. of the B'd of Health of the taxing District of Shelby County (City of Memphis) for the year 1889.

Board of Health, Newport, R. I.:—
Fifth Ann. Rep. of the B'd of Health of Newport, R. I., for the year 1889.

Board of Health, Reading, Pa.:—
Ann. Rep. of the Board of Health of the City of Reading, for the year 1889.

Board of Health, Scranton, Pa.:—
Ann. Rep. of the B'd of Health of the City of Scranton, Pa., for the year ending Dec. 31, 1889.

Bockh, R., Berlin, Germany.:—
Die Bevölkerungs-Und Wohnungs-Aufnahme nom 1 December 1885 in der Stadt Berlin.
Statistiches Jahrbuch der Stadt Berlin. Statistik der Jahre 1886 und 1887.
Bodine, J. M., M. D., Louisville, Ky.:—
Valedictory Address to the Graduates of the fifty-third session of the Med. Dept. of the University of Louisville, Feb. 28, 1890.
Böhmert, Dr., Dresden, Saxony:—
Kalender und Statistisches Jahrbuch für das Konigreich Sachsen nebst Marktverzeichnissen für Sachsen und die Machbarstaaten auf das Jahr 1890.
Zeitschrift des K. Sachsischen Statistischen Bureaus XXXIV. Jahrgang 1888. Heft III. and IV., Supplemtheft zum XXXIV., Jahrgang 1888.
Zeitschrift des K. Sachsischen Statistischen Bureaus XXXV, Jahrgang 1889. Heft I und II.
Bonte, J. H. C., Berkeley, California:—
Ann. Rep. of the Sec'y to the B'd of Regents of the University of California, for the year ending June 30, 1889.
Brigham, Dr. E. H., 19 Boylston Place, Boston, Mass.:—
Medical Communications of the Mass. Med. Society.
Brown, H. J., Ann Arbor, Mich.:—
Proceedings of the Mich. State Pharmaceutical Assn. at its Seventh Annual Meeting, held at Detroit, Sept. 17, 18 and 19, 1889.
Bryce, Peter H., M. D., Toronto, Ont.:—
Seventh Ann. Rep. of the Prov. B'd of Health of Ontario, 1888.
Bulletin 1.—Prov. B'd of Health of Ont.—The Flour Moth "Ephestia Kuhniella."
Report on an outbreak of Contagious Venereal Disease Amongst Horses in the County of Kent, Ont.
Rep. of the Fourth Ann. Meeting of the Association of Executive Health Officers of Ont., held at Brookville, Aug. 20 and 21, 1889.
Bureau of Education, Washington, D. C.:—
History of Higher Education in South Carolina, with a Sketch of the Free School System.
Education in Georgia.
History of Education in Florida.
Higher Education in Wisconsin.
The History of Federal and State Aid to Higher Education in the United States.
English-Eskimo and Eskimo-English Vocabularies.
Honorary Degrees as conferred in American Colleges.
Rules for a Dictionary Catalogue.
The History of Federal and State Aid to Higher Education in the United States.
Rules for a Dictionary Catalogue.
Honorary Degrees as Conferred in American Colleges.
Burwick, Sergeant James A., Sacramento, Cal.:—
Ann. Met. Review of the State of California, for the year 1888.
Canfield, William B., A. M., M. D., Baltimore, Md.:—
Practical Notes on Urinary Analysis.
Canniff, Wm., M. D., M. R. C. S., Toronto, Ont.:—
Ann. Rep. of the Local B'd of Health, City of Toronto, year 1889.
Cantwell, A. W., M. D., Davenport, Iowa:—
Ann. Rep. of City Officers of the City of Davenport, Iowa, for the year ending Feb. 28, 1890.
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Vail, J. H. & Co., N. Y. City, N. Y.:—
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Wadlin, Horace G., Boston, Mass.:—
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Waterhouse, S., Washington University:—
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Watson, Irving A., Concord, N. H.:—
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Wickersham, Swayne, Chicago, Ill.:—
Dep't of Health, City of Chicago. Laws, ordinances, Rules, etc., Relating to the Ventilation, Light, Drainage and Plumbing of Proposed New Buildings for Habitation. Diagrams of Plumbing.

Report of the Dep't of Health of the City of Chicago, for the year 1889.

Whitelegge, Arthur, M. D., Nottingham, Eng.:—
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Wolf, T. R., M. D., Newark, Delaware:—
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Wright, Carroll D., Washington, D. C.:—
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Wright, Frank W., M. D., New Haven, Conn.:—
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Means to prevent the Spread of Typhoid fever.

Donor Unknown:—
The Transfer of the U. S. Weather Service to a Civil Bureau.

ACCESSIONS.

BY PURCHASE.

Tenth Report of the Medical Officer of the Privy Council, with Appendix, 1867.
Elementary Theory of Tides, etc,—T. K. Abbott, D. D.
The Climates and Weather of India, Ceylon and Burmah.—Henry F. Blanford.
Forty-Fifth Annual Report of the Registrar-General of Births, Deaths and Marriages in England.
Supplement to the Forty-Fifth Annual Report of the Registrar-General of Births, Deaths and Marriages in England.
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Forty-seventh Annual Report of the Registrar-General of Births, Deaths and Marriages in England.
Forty-eighth Annual Report of the Registrar-General of Births, Deaths and Marriages in England.
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Pulmonary Consumption: Its Etiology, Pathology and Treatment.—C. J. B. Williams, M. D., L L. D., F. R. S.
The Story of the Bacteria and their Relations to Health and Disease.—T. Mitchell Prudden.
The Ventilation and Warming of School Buildings.—Gilbert B. Morrison.
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History and Pathology of Vaccination, Vols. I. and II.—Edgar M. Crookshank, M. D.
Hygiene and Public Health.—Louis C. Parkes, M. D.
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An elementary Treatise upon the Method of Least Squares.—George C. Comstock.
An Address to the King and Parliament of Great Britain Relative to Influenza, etc.—W. Hawes, M. D.
Annals of Influenza or Epidemic Catarrhal Fever in Great Britain from 1510 to 1837.
Archives de Medecine Experimentale et D'Anatomie Pathologique.
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Scientific American and Supplement, New York.
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Nature, London.
British Medical Journal, London.
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American Meteorological Journal.
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ACCESSION BY EXCHANGE.

Received in Exchange for Publications of this Board (in some instances incomplete volumes).

Agricultural College Bulletin, Lansing, Mich.
Alabama Weather Service.
American Analyst, New York.
American Exchange and Review, Philadelphia.
American Monthly Microscopical Journal, New York.
American Grocer, New York.
American Pharmacist, Detroit.
American Practitioner and News, Louisville, Ky.
Annals of Hygiene, Phila.
Anti-Adulteration Journal, Phila.
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Bulletin Mensuel du Bureau de Demographie, Marseilles.
Bulletin de la Société des Crêches.
Bulletin, Monthly, Colorado Weather Service.
Bulletin, New England Meteorological Society.
Bulletin, North Carolina Board of Health.
Bulletin, Ontario Health.
Bulletin, Cornell University.
Calcutta Health Officer's Quarterly Report.
Canada Lancet, Toronto.
Canadian Practitioner, Toronto.
Canada Educational Monthly, Toronto.
Cincinnati Lancet-Clinic.
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Columbus Medical Journal.
Confectioner's Journal, New York.
Cleveland Medical Gazette.
Good Health, Battle Creek.
Hygiene Pratique, Paris.
Illinois Monthly Weather Review.
Indiana State Weather Service.
Indicator, Detroit.
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Journal Amer. Med. Assoc., Chicago.
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Journal Franklin Institute.
Journal Comparative Medicine and Veterinary Archives, Phila.
Leonard's Illustrated Monthly, Detroit.
Memphis Medical Monthly.
Missouri Weather Service.
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Monthly Sanitary Record, Columbus.
National Druggist, St. Louis.
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New Jersey State Weather Service.
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Nashville Journal of Medicine and Surgery.
North Carolina Agricultural Experiment Station and Weather Service.
North Carolina Medical Journal, Wilmington.
Northwestern Lancet, St. Paul.
Ohio Meteorological Bureau.
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Quarterly Journal Royal Meteorological Society.
Quarterly Return of Marriages, Births and Deaths in Ireland.
Report, Oregon State Weather Bureau.
Report of New York Meteorological Observatory.
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LOANS FROM THE LIBRARY.

Publications drawn out, and not yet returned to the Library, are as follows:

BY HOMER O. HITCHCOCK, M. D.

Prevention of Cholera Infantum and Kindred Disorders, No. 1528.

BY HON. LEROY PARKER.

An Ordinance Relative to the Appointment and Duties of the City Physician of West Bay City, No. 1760.
Sanitary Charts on Management of Infants, No. 2515.

BY REV. D. C. JACOKES, D. D.

Report of Mass. Board of Education on Proposed Survey of the Commonwealth, No. 869.
Memorandum of the Am. Pub. Health Assoc., on Legislation affecting Public Health, No. 1750.
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Separate System of Drainage, No. 326.
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Twelve Photographs of Illustrative Diagrams on the Influence of Climate on Phthisis and Rheumatism, No. 1595.
Playter's Elementary Anatomy, Physiology and Hygiene, No. 1762.
Sewerage at Providence, No. 4784.
Storm Water in Town Sewerage, No. 2441.
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BY BELA COGSHALL, M. D.

Scientific American, July 5, 1879.

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Reference Handbook of the Medical Sciences, Vol. III., No. 6686.
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Diagrams of Low Water in Wells and Typhoid Fever, No. 7202.
Diagrams of Low Water in Philadelphia, No. 5392.
Sewer Gas and Contaminated Water Causes of Typhoid Fever, No. 4009.
Epidemic of Typhoid Fever, Plymouth, No. 5056.
Typho-Malarial Fever, etc., No. 927.
Etiology of Enteric Fever, No. 1057.
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La Malaria de Rome, No. 2659.
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Drainage and Sewerage of Dwellings, No. 4084.
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New York Medical Journal, Oct. 23 and 30, 1886.
Prize Essay by A. N. Bell; Schools, No. 5849.

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Report on Plans for Securing Records of Deaths, No. 1703.
State Boards of Health, Indiana, etc., No. 3395.
Some Fallacies of Statistics—Rumsey, No. 678.
Death Rate of Each Sex in Mich.—Baker, No. 538.

BY HON. W. W. ROOT, M. D.

Sanitary Work in Lansing, Mich., No. 2031.
Mayor's Address, Aurora, Ill., 1879, No. 1879.

BY I. H. BARTHOLOMEW, M. D.

Medical News, Vol. 49, No. 6018.
New Treatment of Peri-Uterine Inflammation, No. 6189.
Treatment of Fibroid Tumors.

BY FOSTER PRATT, M. D.

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BY A. M. ELSWORTH, M. D.

Third Annual Report of Conn. State Board of Health, 1880, No. 2330.

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Giving notice to householders of presence of contagious diseases, and establishing quarantine, issued by Board of Health of St. Clair City, No. 2624.
Health of St. Clair City.
"Health Regulations" of Village of Tecumseh.
Orders, Regulations and Suggestions of the Board of Health of Mt. Pleasant, N. Y., No. 4045.
The Therapeutic Gazette, Oct. 15, 1885.

BY M. T. GASS.

Registration of Plumbers, etc., Health Department, N. Y. City, No. 3215.

BY FRANK WELLS.

National Pure Food Convention, 1887, No. 5780.

BY PROF. VICTOR C. VAUGHAN.

Le Service Communal de la Désinfection at Bruxelles, No. 4616.
Internationaler Congress für Hygiene, Nos. I., II., III., IV., V., VII., VIII., IX., X., XII., XIII., XIV., XV., XVI., XVII., XIX., XX., XXI., XXIII., XXV., Nos. 6071, 6072, 6073, 6074, 6075, 6076, 6077, 6078, 6079, 6080, 6081, 6082, 6083, 6084, 6085, 6086, 6087, 6088, 6089, 6090.
Consular Report, Oct., 1889.
Annals of Hygiene, Nov. 1, 1887.
Monthly Sanitary Record, Feb. No., Vol. I.

BY L. A. WARSABO.

Parkes Hygiene, No. 85.

BY J. A. WESSINGER, M. D.

Sanitary Work in Villages, etc.—Slag, No. 657.
Sewage Question—Krepp, No. 180.
House Drainage and Water Service—Boyles, No. 1139.
Parke's Hygiene, No. 4128.

BY H. S. BARTHOLOMEW.

Practical Histology.

BY GEO. E. WILLITTS.

Climate and Time. No. 187.
Popular Science Monthly, Vol. 27, 1885; Vol. 29, 1885-86; Vol. 29, 1886; Nos. 6392, 6393, 6371.
First Report Royal Commission on Vaccination, No. 7257.
Popular Science Monthly, May and June, 1890.
Progress of Preventive Medicine, etc.—Thorn Thorn.

BY PROF. S. W. BAKER.

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Report of Com. concerning San. Condition of Schools in Philadelphia, No. 1767.
Transactions San. Inst. of Great Britain, 1879, No. 4688.

BY F. S. COLLER.

Impurities in Potable Water—Davis, No. 7072.

BY C. L. WILBUR.

Diseases of Children—Smith, No. 665.

BY PROF. DELOS FALL.

Fourth Ann. Report State Board of Health of South Carolina, 1883, No. 3945.
Journal of the Amer. Med. Assoc., Nov. 3, 1888.
Public Health Reports and Papers of Amer. Pub. Health Assoc., No. 998.
The Story of Bacteria—Pruden.
Therapeutic Gazette, Vol. XIV, March 15, 1890.

BY P. P. SHORTS.

Rules for Checking Contagious Diseases, No. 5622.
Infectious Diseases in Public Schools.—L. W. Baker.
Prevention of Diphtheria, Scarlet Fever, etc.—J. H. Raymond.
Prevention of Contagious Diseases.—James Crane, No. 2610.
Proceedings of the National Conference of State Boards of Health.

BY CHARLES F. RUGGLES.

Curative Effect of Baths, No. 131.
Popular Science Monthly, Vol. 12, No. 1591.
Medical Record, Vol. 13, No. 1587.
London Lancet, July-Dec., 1883, No. 4530.
Scientific American Sup., July 9, 1887.

BY DR. H. A. BARBER.

Michigan Tradesman Sup., Aug. 22, 1888.
Food, Its Adulterations, etc., No. 655.
Foods.—Smith, No. 99.
Proceedings National Pure Food Convention, 1887, No. 6466.
Pure Food Debate, No. 6416.
Adulteration of Food.—Bartlett, No. 3312.

BY D. A. PELTON.

Foster's Physiology.—Reichert, No. 5608.
Language of Medicine.—Campbell, No. 6502.
Human Body.—Martin, No. 4021.
Dictionary of German Medical Terms, No. 4372.
Practical Physiology.—Foster, No. 706.
Braun's Atlas of Topographical Anatomy, No. 1025.

BY DR. CHARLES H. BRUCKER.

Fothergill's Handbook of Treatment, No. 1026.

BY LEMON BARNES, M. D.

Public Health, Disinfection and Disinfectants, No. 6734.

BY DR. T. B. GALBRAITH.

Monthly Bulletin, Ia., July, 1888.
Mich. State Pharc. Assoc., Sixth Ann. Meeting, 1888.

BY H. L. THAYER.

A Farmer's Vacation.—G. E. Waring, No. 666.
Swiss Cross, Vols. 2 and 3, 1887-88.
Popular Science News, Vol. 19, No. 6407.

BY JUDGE J. B. MCMAHON.

Proceedings of the Royal Society of Edinburgh, 1887-88, No. 6753.

BY CHAS. L. KING, M. D.

Eyesight and How to Care for it, No. 1952.

BY THEO. B. MAC CLURE.

Text Book on Meteorology, No. 170.
Weather, No. 6650.

BY MRS. S. L. SMITH.

Scientific American Sup., Vol. 21, Jan.-June, 1886, No. 6367.

The following table shows the amount and kind of hard paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:—

Kind of paper.	On hand at last report.		Purchased since last report.		Used during the fiscal year.		On hand June 30, 1890.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat	3	44	6	.....	3	44	6	.....
Crown	6	260	8	.....	12	.....	2	260
Folio Post	29	205	20	.....	28	433	20	252
Demy	7	373	.....	.....	3	161	4	212
Medium	1	205	.....	.....	.....	58	1	147
Byron Weston	.....	350	.....	.....	.....	200	.....	150
Foolscap	1	360	.....	.....	.....	80	1	380
Legal cap	2	.....	.....	.....	.....	140	1	340
Blotting paper	.....	140	.....	.....	.....	70	.....	70
Blue cover paper	12	276	.....	.....	5	276	7	.....
Postoffice paper	1	250	.....	.....	.....	.....	1	250
Manilla wrapping paper	1	132	4	.....	.....	400	4	212

There are now on hand 2,100 sheets of hard paper of half letter size, 189 sheets of note paper, and 214 sheets of one-half note size.

There were about 129,147 envelopes on hand at time of making the last report, 34,000 of the various kinds used in the office have been purchased since, making a total of 163,147. There are now on hand 60,279 printed envelopes, and 54,512 blank envelopes, making a total of 114,791. About 48,356 have been used in the work of the office.

Vouchers for postage (for use in the office) have been allowed during the year to the amount of $1,004.00. The cost of postage during the fiscal year has been $993.00, as follows:—

Distribution of Annual Reports	$209 57
General distribution of documents and circulars	373 76
Sending weekly and monthly bulletins	34 63
Collection and dissemination of statistics and information in regard to communicable and other diseases	71 64
Sending out announcements and programs for sanitary conventions	70 43
Sending meteorological material to observers	6 40
Regular and special correspondence of the office, and all other postage (including a considerable amount for distribution of documents on the restriction of diphtheria, scarlet fever, and typhoid fever, to localities where those diseases occurred)	226 57
Total	$993 00
Postage money on hand	11 00
	$1,004 00

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR—TWELVE MONTHS—ENDING JUNE 30, 1890, AS PER VOUCHERS NUMBERS 1741 TO 1905 INCLUSIVE.

Chemical analyses		$10 00
Engraving, drawing, etc.		1 70
Expenses of members	Attending Meetings	45 15
	Other Official	744 86
Instruments and books		347 05
Paper, Stationery, etc.		227 98
Postage	Office	1,004 00
	Members	
Printing and binding		1,008 80
Secretary		2,500 00
Special investigations		
Miscellaneous		546 83
Total		$6,434 87

Respectfully submitted,

HENRY B. BAKER,
Secretary.

EXPENDITURES BY THE STATE BOARD OF HEALTH IN THE CALENDAR YEAR, 1889.

The foregoing is reported, in compliance with law, relative to the fiscal year. But the appropriations for the Board are for the calendar year, and they amount to six thousand dollars. The expenditures for any calendar year, therefore, cannot exceed six thousand dollars. The following is a classified statement of expenditures for the calendar year 1889.

CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR 1889.

Chemical analyses		$10 00
Engraving, drawing, etc.		
Expenses of members	Attending meetings	73 90
	Other official	640 35
Instruments and books		277 66
Paper, stationery, etc.		154 17
Postage	Office	1,109 00
	Members	
Printing and binding		843 09
Secretary		2,500 00
Special investigations		
Miscellaneous		385 61
Total		

EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations ($6,000) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the expenses in the examination of plans for public buildings; these expenditures *on account of* but not by the board are provided for by other acts of the legislature than those appropriating money to be expended by the board, and the accounts are kept in other offices, not in the office of the Board of Health; the accounts for clerk hire are kept by the Auditor General, and reported in his Annual Report; the accounts for publication of the annual reports, and for expenses in the examinations of plans for public buildings, are kept by the Board of State Auditors, and are published in the Annual Report of that Board.

Respectfully submitted,

HENRY B. BAKER,

Secretary.

This Eighteenth Annual Report is respectfully submitted.

HENRY B. BAKER,

Secretary.

PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1889.

COMPARISONS OF CONDITIONS IN 1889 WITH THOSE IN PRECEDING YEARS.

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF HEALTH AND FOR THE UNITED STATES SIGNAL SERVICE.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

In the Annual Reports of this Board, there has been published for each of the years 1877 to 1888, inclusive, a summary relative to the principal meteorological conditions as observed during the year. This paper continues the subject for the year 1889. The names of the observers for 1889 and the months for which copies of registers of meteorological conditions were received from each are stated in Exhibit 1, page 10. In Exhibit 2, page 11, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, fogs, rainfall, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only the meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the Report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the report for 1887, in an article on "The Causation of the Cold-weather Diseases," influenza, tonsilitis, bronchitis, scarlet fever, diphtheria, and small-pox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness

statistics is made in the Report for 1887, in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-passages."

The article in this Report in relation to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

Incidentally,—it is believed that there is nowhere else so complete a statement of the facts relating to the meteorology of Michigan as here presented, for any use for which such knowledge may be needed, now or hereafter.

CHANGE OF HOURS FOR TAKING METEOROLOGICAL OBSERVATIONS AT U. S. SIGNAL-SERVICE STATIONS.

On July 1, 1888, the hours for taking meteorological observations at the U. S. Signal Service stations in Michigan were changed from 7 A. M., 3 P. M., and 10 P. M., 75th. meridian time, to 8 A. M. and 8 P. M., 75th. meridian time; and the 3 P. M. and 10 P. M. observations were discontinued. The average of two observations being taken instead of three as previously.

The local time at the U. S. Signal Service stations in Michigan corresponding to 8 A. M. and 8 P. M., 75th. meridian time, as reported on monthly registers, is as follows:—

Port Huron, 7:30 A. M. and 7:30 P. M.
Detroit, 7:28 A. M. and 7:28 P. M.
Alpena, 7:26 A. M. and 7:26 P. M.
Grand Haven, 7:15 A. M. and 7:15 P. M.
Marquette, 7:11 A. M. and 7:11 P. M.

The question arose whether or not observations made bi-daily at the above-mentioned hours give the same, or nearly the same, averages as those made tri-daily at 7:00 A. M., 2:00 P. M., and 9 P. M., local time.

Comparisons were made between bi-daily observations, at 7:00 A. M. and 7:00 P. M., and tri-daily observations, at 7:00 A. M., 2:00 P. M. and 9:00 P. M., all local time, at from three to four representative stations in Michigan, for the year 1889, on the following subjects:—Average temperature, absolute humidity, relative humidity, per cent of cloudiness, atmospheric pressure, and atmospheric ozone (day and night). These results are shown in Exhibits A. B. C. D. E. F. and G., on following pages.

EXHIBIT A.—*Comparison of the Average Atmospheric Temperature, for the Year, and for each month of the year 1889, at four stations in Michigan, by Observations made at 7 A. M., 2 P. M. and 9 P. M., with Observations made at 7 A. M. and 7 P. M., all local time, showing a Lower Average by the Bi-daily, than by the Tri-daily Observations.*

Year, and Months.		Average Temperature—Degrees Fahr.											
		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 4 stations*	Tri-daily observations.	48.23	28.59	19.12	36.98	47.00	57.74	64.38	71.49	69.42	62.07	45.56	38.58	37.87
Harrisville	Tri-daily observations.	43.55	26.16	14.71	32.88	42.12	51.10	57.64	66.22	64.68	57.57	40.91	36.52	32.08
Thornville	Tri-daily observations.	48.59	28.44	18.21	36.78	46.99	58.48	65.31	72.46	70.66	63.23	45.52	39.19	37.80
Lansing, S. B. of H.	Tri-daily observations.	47.61	28.54	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.39	37.71	37.31
Ann Arbor	Tri-daily observations.	47.77	27.95	18.79	36.23	45.99	57.60	64.30	71.70	68.70	61.00	45.30	38.70	37.00
Kalamazoo	Tri-daily observations.	48.96	29.41	20.58	38.11	48.09	57.89	64.55	71.22	69.87	62.72	47.01	38.71	39.37
Marshall	Tri-daily observations.	48.83	30.28	22.11	38.41	48.51	58.59	65.30	72.47	69.06	62.04	44.23	37.34	37.67
Av. for 4 stations*	Bi-daily observations.	46.59	27.46	17.68	34.97	45.29	56.18	63.11	70.37	67.32	59.56	43.42	37.26	36.51
Harrisville	Bi-daily observations.	†	.....	13.55	31.78	41.44	51.17	56.90	67.29	64.73	57.00	40.02	34.25	30.81
Thornville	Bi-daily observations.	46.69	26.68	16.00	34.44	45.06	56.40	63.65	71.18	68.58	60.37	43.54	37.95	36.45
Lansing, S. B. of H.	Bi-daily observations.	45.94	27.34	17.58	34.36	44.74	55.60	62.55	69.97	66.20	58.67	41.98	36.57	35.66
Ann Arbor	Bi-daily observations.	46.11	26.97	17.49	34.75	44.59	56.17	62.87	70.40	66.61	58.29	43.02	36.62	35.55
Kalamazoo	Bi-daily observations.	47.63	28.83	19.66	36.32	46.75	56.53	63.37	69.93	67.87	60.89	45.14	37.88	38.36
Marshall	Bi-daily observations.	‡	.....	20.38	35.77	45.75	55.99	62.92	69.84	65.35	58.20	40.91	36.02	36.09
Av. temperature Lower by bi-daily* than by tri-daily observations		1.64	1.13	1.44	2.01	1.71	1.56	1.27	1.12	2.10	2.51	2.14	1.32	1.36

* Not including Harrisville and Marshall.
† The average for 11 months is 44.45.
‡ The average for 11 months is 47.93.

EXHIBIT B.—*Comparison of the Average Absolute Humidity of the Atmosphere for the Year, and for each month of the Year 1889, at four stations in Michigan, by Observations made at 7 A. M., 2 P. M., and 9 P. M., with Observations made at 7 A M., and 7 P. M., (all local time), showing the different results obtained by the two methods.*

Year and Months.		Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
		Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 4 stations*	Tri-daily observations.	3.54	1.79	1.42	2.16	2.97	4.16	5.59	6.37	5.49	4.76	2.75	2.57	2.49
Harrisville	Tri-daily observations.	2.72	1.10	0.58	1.37	2.28	3.10	4.04	5.15	4.89	4.25	2.34	1.94	1.63
Thornville	Tri-daily observations.	3.64	1.90	1.53	2.17	3.00	4.21	5.64	6.61	5.59	4.84	2.89	2.75	2.53
Lansing, S. B. of H.	Tri-daily observations.	3.35	1.67	1.19	2.03	2.83	3.79	5.28	6.04	5.43	4.56	2.61	2.38	2.34
Ann Arbor	Tri-daily observations.	3.66	1.79	1.45	2.26	3.05	4.55	5.90	6.69	5.50	4.83	2.68	2.60	2.58
Kalamazoo	Tri-daily observations.	3.53	1.81	1.51	2.19	2.98	4.09	5.54	6.14	5.45	4.81	2.83	2.53	2.49
Marshall	Tri-daily observations.	3.72	2.04	1.71	2.45	3.19	4.22	5.62	6.42	5.75	4.87	2.94	2.66	2.76
Av. for 4 stations*	Bi-daily observations.	3.52	1.78	1.35	2.09	2.89	4.08	5.54	6.44	5.54	4.71	2.73	2.54	2.54
Harrisville	Bi-daily observations.	†	.....	0.56	1.29	2.22	3.08	3.93	5.27	4.98	4.20	2.24	1.85	1.53
Thornville	Bi-daily observations.	3.60	1.90	1.43	2.09	2.92	4.16	5.55	6.76	5.64	4.73	2.84	2.72	2.50
Lansing, S. B. of H.	Bi-daily observations.	3.32	1.66	1.21	1.95	2.78	3.76	5.31	6.06	5.51	4.52	2.56	2.38	2.24
Ann Arbor	Bi-daily observations.	3.66	1.78	1.35	2.17	3.02	4.41	5.86	6.77	5.52	4.78	2.71	2.54	2.95
Kalamazoo	Bi-daily observations.	3.49	1.79	1.39	2.18	2.90	3.99	5.44	6.16	5.50	4.79	2.80	2.50	2.48
Marshall	Bi-daily observations.	‡	.....	1.56	2.27	3.08	4.17	5.60	6.49	5.64	4.77	2.79	2.63	2.64
Absolute humidity Greater by bi-daily, than by tri-daily observations*		.....	.....	.....	.....	.....	.....	.....	.07	.05	.....	.....	.....	.05
Absolute humidity Less by bi-daily, than by tri-daily observations*		.02	.01	.07	.07	.08	.08	.05	.....	.....	.05	.02	.03	.....

* Not including Harrisville and Marshall.
† The average for 11 months is 2.83.
‡ The average for 11 months is 3.79.

EXHIBIT C.—*Comparison of the Average Relative Humidity of the Atmosphere for the Year, and for each month of the Year 1889, at four stations in Michigan, by Observations made at 7 A. M., 2 P. M. and 9 P. M., with Observations made at 7 A. M. and 7 P. M., (all local time), showing a Lower Average by the Bi-daily, than by the Tri-daily Observations.*

Year and Months.		Per Cent of Saturation—Relative Humidity.												
		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 4 stations*	Tri-daily observations.	76	85	86	73	69	69	80	75	67	70	69	83	82
Harrisville	Tri-daily observations.	62	59	45	52	60	59	68	67	67	70	66	68	65
Thornville	Tri-daily observations.	77	89	91	75	70	69	79	76	66	70	73	87	84
Lansing, S. B. of H.	Tri-daily observations.	72	80	79	68	65	63	77	72	68	68	66	77	77
Ann Arbor	Tri-daily observations.	80	87	87	79	75	77	86	79	70	74	71	86	88
Kalamazoo	Tri-daily observations.	73	83	88	70	66	66	77	71	64	68	65	81	77
Marshall	Tri-daily observations.	80	90	95	78	73	69	78	73	72	73	79	90	93
Av. for 4 stations*	Bi-daily observations.	79	87	88	77	72	71	82	78	73	75	73	85	84
Harrisville	Bi-daily observations.	†	.....	47	53	60	59	68	67	69	71	65	68	66
Thornville	Bi-daily observations.	82	94	97	79	73	73	81	80	71	75	77	90	88
Lansing	Bi-daily observations.	75	81	82	73	68	65	80	73	75	73	71	81	80
Ann Arbor	Bi-daily observations.	82	87	85	81	79	79	89	83	75	80	74	88	89
Kalamazoo	Bi-daily observations.	76	85	89	74	68	68	79	74	69	73	70	82	80
Marshall	Bi-daily observations.	‡	.....	92	81	78	74	83	79	79	80	68	93	94
Relative humidity Greater by bi-daily, than by tri-daily observations*		3	2	2	4	3	2	2	3	6	5	4	2	2

* Not including Harrisville and Marshall.
† The average for 11 months is 63.
‡ The average for 11 months is 82.

EXHIBIT D.—*Comparison of the Average Per Cent of Cloudiness for the Year, and for each month of the Year 1889, at four stations in Michigan, by Observations made at 7 A. M., 2 P. M. and 9 P. M., with Observations made at 7 A. M. and 7 P. M. (all local time), showing the different results obtained by the two methods.*

Year and Months.		Per Cent of Cloudiness.											
		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 4 stations*	Tri-daily Observations.	55	72	69	49	52	51	70	38	31	41	57	75	62
Harrisville	Tri-daily Observations.	60	78	71	54	59	65	72	33	42	41	63	67	72
Thornville	Tri-daily Observations.	53	68	65	49	52	46	62	36	33	36	57	75	57
Lansing, S. B. of H.	Tri-daily Observations.	55	73	67	46	50	50	73	41	30	42	57	73	63
Ann Arbor	Tri-daily Observations.	56	71	66	52	55	54	73	36	33	42	58	74	60
Kalamazoo	Tri-daily Observations.	57	75	78	50	51	53	70	38	28	45	54	78	68
Marshall	Tri-daily Observations.	49	72	67	39	53	49	56	25	19	30	44	71	57
Av. for 4 stations*	Bi-daily Observations.	56	74	68	52	55	52	71	37	37	40	56	74	61
Harrisville	Bi-daily Observations.	†	.....	69	53	56	63	76	40	47	39	59	62	72
Thornville	Bi-daily Observations.	54	74	66	56	56	44	66	31	34	32	59	71	61
Lansing, S. B. of H.	Bi-daily Observations.	57	71	66	46	53	53	74	43	42	44	57	72	60
Ann Arbor	Bi-daily Observations.	57	79	63	53	58	53	69	38	39	42	58	72	58
Kalamazoo	Bi-daily Observations.	58	72	77	54	54	57	74	35	34	42	48	79	66
Marshall	Bi-daily Observations.	‡	.....	70	43	53	49	57	24	19	31	41	73	54
Per Cent of Cloudiness **Greater** by Bi-daily than by Tri-daily Observations*		1	2	.....	3	3	1	1	.....	6	.....	.....	.....	.....
Per Cent of Cloudiness **Less** by Bi-daily, than by Tri-daily Observations*		.....	.....	1	.....	.....	.....	.....	1	.....	1	1	1	1

* Not including Harrisville and Marshall.
† The average for 11 months is 58.
‡ The average for 11 months is 47.

EXHIBIT E.—*Comparison of the Average Atmospheric Pressure, for the Year, and for each Month of the Year 1889, at four stations in Michigan, by Observations made at 7 A. M., 2 P. M., and 9 P. M., with Observations made at 7 A. M., and 7 P. M., (all local time), Showing a Greater Average by the Bi-daily, than by the Tri-daily Observations.*

Year and Months.		Inches of Mercury.—Atmospheric Pressure.												
		Year.	Jan	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 4 Stations*	Tri-daily Observations.	29.008	28.948	29.049	28.954	28.996	28.939	28.986	28.989	29.082	29.018	29.100	29.011	29.027
Harrisville	Tri-daily Observations.	29.313	29.256	29.366	29.274	29.301	29.241	29.279	29.282	29.373	29.310	29.430	29.312	29.329
Thornville	Tri-daily Observations.	28.935	28.869	28.968	28.866	28.927	28.867	28.919	28.923	29.013	28.957	29.031	28.930	28.955
Lansing, S. B. of H.	Tri-daily Observations.	29.072	29.006	29.111	29.026	29.060	28.999	29.050	29.054	29.147	29.080	29.167	29.076	29.085
Ann Arbor	Tri-daily Observations.	29.021	28.976	29.069	28.961	29.005	28.955	28.998	28.999	29.094	29.029	29.099	29.022	29.050
Kalamazoo	Tri-daily Observations.	29.004	28.942	29.046	28.962	28.992	28.934	28.977	28.980	29.074	29.005	29.102	29.016	29.019
Marshall	Tri-daily Observations.	29.013	28.960	29.062	28.968	28.999	28.945	28.997	28.988	29.078	29.016	29.102	29.016	29.027
Av. for 4 Stations*	Bi-daily Observations.	29.013	28.959	29.053	28.960	28.999	28.940	28.988	28.990	29.083	29.023	29.108	29.013	29.039
Harrisville	Bi-daily Observations.	†	.....	29.378	29.286	29.312	29.243	29.283	29.284	29.363	29.317	29.440	29.317	29.350
Thornville	Bi-daily Observations.	28.937	28.852	28.973	28.875	28.932	28.870	28.928	28.929	29.015	28.967	29.030	28.919	28.956
Lansing	Bi-daily Observations.	29.078	29.045	29.118	29.028	29.065	29.001	29.049	29.052	29.148	29.083	29.171	29.082	29.095
Ann Arbor	Bi-daily Observations.	29.024	28.983	29.063	28.966	29.000	28.955	28.997	28.997	29.093	29.035	29.121	29.028	29.055
Kalamazoo	Bi-daily Observations.	29.012	28.956	29.057	28.969	28.997	28.934	28.979	28.982	29.074	29.008	29.110	29.024	29.051
Marshall	Bi-daily Observations.	‡	.....	29.075	28.977	29.004	28.944	28.997	28.991	29.078	29.021	29.105	29.023	29.030
Atmospheric Pressure Greater by Bi-daily, than by Tri-daily observations*		.005	.011	.004	.006	.003	.001	.002	.001	.001	.005	.008	.002	.012

* Not including Harrisville and Marshall.
† The average for 11 months is 29.325.
‡ The average for 11 months is 29.022.

EXHIBIT F.—*Comparison of the Average Amount of Atmospheric Ozone (Day) for the Year, and for each Month of the Year 1889, at three stations in Michigan, by Observations made by exposing Test-paper,—Schönbein's Formula,—from 7 A. M. to 2 P. M., with Observations made by exposing the Test-paper from 7 A. M. to 7 P. M., showing the different results obtained by the two methods.*

Year and Months.		Ozone by Day.—Degree of Coloration of Test-Paper.												
		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 3 Stations*	7 A. M. to 2 P. M.	2.51	2.80	3.00	3.16	2.97	2.41	2.71	2.37	2.22	2.23	2.17	2.26	1.82
Harrisville		3.15	3.06	3.04	3.19	2.93	2.90	3.30	3.26	2.74	3.37	3.32	3.57	3.16
Thornville		2.25	3.10	3.07	3.08	2.33	1.68	2.37	1.26	1.00	1.83	2.00	2.87	2.71
Lansing, S. B. of H		2.45	2.32	2.57	2.48	3.00	2.42	3.10	3.52	2.76	2.58	1.82	1.40	1.42
Ann Arbor		2.82	2.97	3.35	3.96	3.57	3.13	2.67	2.32	2.90	2.47	2.68	2.50	1.32
Kalamazoo		†	.....	.....	1.87	1.87	1.84	1.47	1.32	1.84	1.63	1.29	1.33	1.13
Marshall		2.14	1.35	1.61	1.84	2.27	2.97	2.97	2.45	3.13	2.77	1.48	1.70	1.13
Av. for 3 Stations*	7 A. M. to 7 P. M.	2.69	2.99	3.21	3.21	2.90	2.97	2.85	2.54	2.59	2.40	2.23	2.40	1.97
Harrisville		‡	.....	3.29	3.65	3.97	4.13	4.53	3.81	4.16	4.33	4.32	4.93	4.35
Thornville		2.51	3.72	3.46	3.52	2.83	2.13	2.30	1.26	1.23	1.70	1.97	3.10	2.84
Lansing, S. B. of H.		2.62	2.46	2.86	2.32	2.63	3.29	3.47	3.74	3.37	2.73	1.92	1.47	1.19
Ann Arbor		2.94	2.80	3.31	3.79	3.23	3.50	2.77	2.61	3.16	2.77	2.81	2.63	1.89
Kalamazoo		1.74	2.32	2.32	1.87	1.80	1.77	1.53	1.48	1.94	1.50	1.42	1.57	1.32
Marshall		††	.....	1.86	1.97	2.17	3.06	2.97	2.74	3.13	2.67	1.55	1.73	1.06
Average Degree of Coloration **Greater** by Test-paper exposed from 7 A. M. to 7 P. M., than by Test-paper exposed from 7 A. M. to 2 P. M.		.18	.19	.21	.05	.....	.56	.14	.17	.37	.17	.06	.14	.15
Average Degree of Coloration **Less** by Test-paper exposed from 7 A. M. to 7 P. M. than by Test-paper exposed from 7 A. M. to 2 P. M.		.....	.....	.....	.....	.07	.....	.....	.....	.....	.....	.....	.....	.....

* Not including Harrisville, Kalamazoo and Marshall.
† The average for 10 months is 1.56.
‡ The average for 11 months is 4.13.
†† The average for 11 months is 2.26.
NOTE.—No correction for difference in sensitiveness of test-paper is applied, as test-paper from the same supply was used by the observers throughout the year.

EXHIBIT G.—*Comparison of the Average Amount of Atmospheric Ozone (Night) for the Year, and for each Month of the Year 1889, at three stations in Michigan, by Observations made by exposing Test-paper,—Schönbein's Formula,—from 9 P. M. to 7 A. M., with Observations made by exposing the Test-paper from 7 P. M. to 7 A. M., Showing the different results obtained by the two methods.*

Year and Months.		Ozone by Night.—Degree of Coloration of Test-Paper.											
		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 3 Stations*	9 P. M. to 7 A. M.	2.60	2.77	3.13	3.39	3.33	2.97	3.17	2.45	1.98	2.11	1.84	2.09	1.95
Harrisville		3.59	3.61	3.25	3.42	3.43	3.19	4.20	3.71	3.61	3.63	3.58	3.68	3.84
Thornville		2.89	3.65	3.79	3.77	3.50	2.71	2.90	2.16	1.71	2.07	2.37	2.87	3.23
Lansing S. B. of H.		2.50	2.46	3.07	2.58	3.17	2.90	3.90	3.35	2.11	2.28	1.24	1.73	1.23
Ann Arbor		2.40	2.20	2.52	3.81	3.31	3.30	2.70	1.84	2.13	1.97	1.90	1.67	1.39
Kalamazoo		†	.....	.....	2.35	2.07	1.90	1.27	1.19	1.55	1.20	1.10	1.77	1.74
Marshall		1.95	1.84	1.93	1.74	2.37	3.87	2.97	1.97	2.19	1.50	1.06	1.17	0.77
Av. for 3 Stations*	7 P. M. to 7 A. M.	2.68	2.93	3.08	3.28	3.25	3.11	3.40	2.54	2.22	2.21	1.81	2.20	2.15
Harrisville		‡	.....	4.61	4.52	4.40	4.42	5.40	4.90	5.39	5.03	4.77	4.83	4.87
Thornville		2.69	3.56	3.32	3.19	3.10	2.29	2.77	1.94	1.68	2.03	2.07	2.97	3.35
Lansing, S. B. of H.		2.62	2.50	3.11	2.47	3.23	3.48	4.30	3.48	2.39	2.20	1.23	1.73	1.29
Ann Arbor		2.74	2.73	2.81	4.19	3.43	3.56	3.13	2.19	2.58	2.40	2.13	1.90	1.81
Kalamazoo		1.89	3.23	2.86	2.35	2.20	1.84	1.37	1.26	1.58	0.87	1.23	1.97	1.94
Marshall		††	.....	1.82	1.84	2.37	3.77	2.97	1.90	2.19	1.60	1.10	1.13	0.77
Average Degree of Coloration **Greater** by Test-paper exposed from 7 P. M. to 7 A. M. than by Test-paper exposed from 9 P. M. to 7 A. M.*		.08	.16	.....	.....	.....	.14	.23	.09	.24	.10	.....	.11	.20
Average Degree of Coloration **Less** by Test-paper exposed from 7 P. M. to 7 A. M. than by Test-paper exposed from 9 P. M. to 7 A. M.*		.....	.....	.05	.11	.08	.....	.....	.....	.....	.....	.03	.....	.....

* Not including Harrisville, Kalamazoo and Marshall.
† The average for 10 months is 1.61.
‡ The average for 11 months is 4.83.
†† The average for 11 months is 1.95.
NOTE.—No correction for difference in sensitiveness of test-paper is applied, as test-paper from the same supply was used by the observers throughout the year.

EXHIBIT 1.—*Names of observers whose reports are summarized in the following Meteorological Tables and Diagrams, their places of observation, and the Counties and Geographical Divisions of the State in which these places are situated, and the Months for which reports were received from each observer.*

Name of Observer.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were received.
W. W. Dent, Sergt. Signal Corps, U. S. A.	Marquette	Marquette	U. P.	January to December.
Arthur Beebe	Gulliver Lake	Schoolcraft	U. P.	January to December.
F. W. Conrad, Sergt. Signal Corps, U. S. A	Manistee	Manistee	N. W.	January to May.
James I. Widmeyer, Sergt. Signal Corps, U. S. A.	Manistee	Manistee	N. W.	June to December.
S. E. Wait	Traverse City	Gr. Traverse	N. W.	January to December.
James J. Fitzgerald, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	January to December.
D. W. Mitchell, M. D.	Harrisville	Alpena	N. E.	January to December.
Geo. W. Felger, Sergt. Signal Corps, U. S. A.	Grand Haven	Ottawa	W.	Jan. to Aug., Oct. to Dec.
John W. Kimball	Port Austin	Huron	B. & E.	January to December.
H. L. Boyce, Sergt. Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	January to December.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	January to December.
Prof. J. W. Ewing	Alma	Gratiot	C.	March to December.
Prof. R. C. Kedzie	Agr'l College	Ingham	C.	January to December.
Geo. E. Willetts	Office State B'd of Health, Lansing	Ingham	C.	January to April.
James Satterlee	Office State B'd of Health, Lansing	Ingham	C.	May.
D. H. Pelton	Office State B'd of Health, Lansing	Ingham	C.	June to December.
G. G. Gordon, M. D.	Swartz Creek	Genesee	C.	January and February.
Milton Chase, M. D.	Otsego	Allegan	S. W.	January to December.
Prof. Chas. E. Barr	Albion	Calhoun	S. C.	May to December.
Prof. M. W. Harrington	Ann Arbor	Washtenaw	S. C.	January to December.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	January to December.
Lieut. A. H. Boies	Hudson	Lenawee	S. C.	January to December.
Geo. C. Palmer, Supt. Asylum for Insane	Kalamazoo	Kalamazoo	S. C.	January to December.
W. T. Drake	Marshall	Calhoun	S. C.	January to December.
Lewis Marvill	Parkville	St. Joseph	S. C.	January to December.
C. E. Beers	Tecumseh	Lenawee	S. C.	January to December.
Abner Wilson	Tecumseh	Lenawee	S. C.	April to October.
S. Alexander	Birmingham	Oakland	S. E.	January to December.
Edward A. Evans, Sergt Signal Corps, U. S. A.	Detroit	Wayne	S. E.	January to December.

*The counties in each Division are Stated in Exhibit I, in the article on weekly reports of sickness.

EXHIBIT 2.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1889, at 17 Meteorological Stations in Michigan,—the names of the Stations being arranged in order by latitude, highest first.*

Localities in order of Latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer above Sea Level,—Feet.	Average Temperature, 1889, Degrees Fahr.	Average Atmospheric Pressure, 1889, Inches of Mercury corrected for Tem.
Marquette	46°34'	87°24'	[b] 641.42	[c] 672	40.12	29.245
Gulliver Lake	45°59'	86°1'	627.	631	40.94	29.296
Alpena	45°5'	83°3'	587.	609	41.89	29.346
Traverse City	44°45'	85°40'	598.	605	45.45	29.317
Harrisville	44°39'	83°18'	616.	.....	43.55	29.319
Manistee	44°13'	86°16'	600.	615	44.46	29.344
Port Austin	44°0'	82°0'	478.	.....	46.67	29.340
Alma	43°25'	84°45'	750.	[d] 765	.....	.....
Grand Haven	43°5'	86°18'	[e] 595.3	[f] 620	.....	.....
Port Huron	43°0'	82°26'	602.	639	45.24	29.345
Thornville	* 42°55'	*83°10'	§975.	§960	48.61	28.936
Agricultural College	42°44'	84°29'	820.	834	47.33	29.062
Lansing, S. B. of H.	† 42°44'	†84°33'	¶ 900.	¶ 917	47.65	29.072
Birmingham	42°30'	83°10'	752.	.....	47.58	29.108
Detroit	42°20'	83°3'	603.9	662	47.66	29.311
Battle Creek	42°20'	85°11'	‡ 800.	.....	51.13	29.061
Kalamazoo	42°18'	85°37'	944.	955	48.96	29.004
Ann Arbor	42°17'	83°44'	930.	936	47.83	29.021
Marshall	42°17	84°58'	883.	886	48.83	29.013
Albion	42°14'	84°45'	[a] 960.	965.25	.....	.....
Tecumseh	42°1'	83°57'	.....	.....	47.54	.....
Hudson	41°53'	84°21'	970.	.....	.....	.....

* Estimated from lines on a map of Michigan issued by the General Land office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astromical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43' 53.11" N. and 84°33' 19.68" W.

‡ Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

§ Estimated from data in Tackabury's Atlas of the State of Michigan.

¶ Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven, for the four years, 1879-82.

[a] 965 for July, Sept., Oct., Nov., and Dec.; [b] 673.22 for Aug. to Dec.; [c] 735 Aug. to Dec.; [d] 760 for Aug. to Dec.; [e] 589.5 for Oct. to Dec.; [f] 621.3 for Oct. to Dec.

NOTE.—Green's standard barometer was used at the above stations for the year 1889.

EXHIBIT 3.—*Average Temperature by Year and Months, for each of the Years, 1877-89, and the Average for the 12 Years, 1877-88. These Averages are for Groups of Several Stations in Michigan.*

Years, Etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Yrs.,'77-88	45.91	19.84	23.28	29.12	44.01	56.24	65.46	70.78	67.99	61.07	49.90	36.19	27.02
1877	48.67	19.18	32.27	25.92	46.71	58.24	67.48	72.80	70.52	63.80	52.78	37.57	36.73
1878	49.24	27.17	29.75	41.46	52.27	54.73	65.18	74.22	70.92	63.99	50.13	38.34	22.74
1879	46.82	20.86	20.69	33.08	44.29	58.03	64.70	73.16	68.99	57.43	57.43	36.80	26.41
1880	46.55	34.06	27.93	31.00	44.39	62.27	67.41	69.39	68.07	59.54	46.69	27.24	20.67
1881	47.22	14.93	19.75	29.36	46.53	62.72	63.32	72.95	71.76	67.99	51.87	37.42	34.03
1882	47.14	24.32	33.42	34.12	42.65	51.04	64.43	67.84	69.05	61.70	53.53	37.90	25.72
1883	43.52	15.78	20.03	24.63	43.00	51.37	64.73	68.36	65.41	57.24	46.73	38.10	26.89
1884	44.72	15.14	20.94	28.78	42.00	54.38	67.04	66.70	66.10	64.72	51.56	34.53	24.77
1885	42.36	15.46	10.21	19.51	41.39	53.32	63.39	71.13	63.23	59.14	45.78	38.14	27.59
1886	44.82	18.72	21.18	30.10	46.04	54.69	63.31	68.68	67.36	61.15	51.84	34.32	20.44
1887	44.82	16.58	21.57	25.55	42.09	60.68	66.53	73.22	66.41	57.95	44.46	35.18	27.57
1888	45.03	15.93	21.65	25.89	42.81	53.40	68.03	70.95	68.05	58.20	46.01	38.73	30.73
1889	47.36	28.18	18.57	35.83	46.04	56.74	63.05	70.69	68.58	61.86	44 59	37.95	36.76

EXHIBIT 4.—*Average Temperature by Year and Months, for each of the Years 1879-89, and the Average for the 10 Years, 1879-88, at the Office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 Years, 1879-88	47.11	20.35	23.79	30.65	45.85	58.95	67.74	72.68	69.00	61.58	50.79	36.94	27.06
1879	48.87	21.78	22.49	36.27	47.54	60.88	67.71	75.86	70.65	58.11	59.50	38.22	27.46
1880	48.94	36.81	31.62	34.19	47.46	65.18	69.44	71.69	70.38	61.19	48.64	28.78	21.65
1881	49.59	16.98	22.27	30.59	43.23	66.94	65.99	75.41	74.63	71.33	53.63	38.78	35.28
1882	49.23	25.65	35.88	36.14	44.83	53.10	66.86	72.57	71.34	63.64	55.63	39.00	26.13
1883	45.69	17.01	22.07	28.04	46.42	53.28	66.98	70.42	67.78	59.42	48.31	40.09	28.47
1884	47.43	16.48	23.89	32.26	45.30	58.20	70.69	69.77	68.58	67.99	53.47	36.51	26.01
1885	43.01	15.85	10.49	21.57	43.97	55.71	65.26	73.35	63.28	55.86	45.43	38 21	27.14
1886	46.19	19.02	22.44	32.09	50.16	57.77	66.20	70.87	68.49	61.81	51.78	34.02	19.61
1887	46.69	18.26	24.39	27.81	45.27	64.24	69.44	75.76	67.06	58.66	45.19	36.59	27.63
1888	45.49	15.63	22.38	27.49	44.30	53.91	68.80	71.09	67.77	57.79	46.32	39.16	31.19
1889	47.65	29.00	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.39	37.71	37.31

EXHIBIT 5.— *Average Temperature by Year and Months, for each of the Years 1864–89, and the Average for the 25 Years 1864–88, at the Agricultural College, Michigan.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 25 y'rs, 1864-88	46.40	21.27	23.70	30.80	45.64	58.16	67.69	71.59	68.72	60.24	48.22	35.44	25.60
1864	47.32	22.26	27.32	31.74	45.86	60.19	67.62	74.52	70.72	59.62	45.74	37.88	24.27
1865	48.12	21.10	27.59	39.96	47.40	57.65	70.76	65.60	65.84	67.66	46.50	38.63	27.72
1866	45.60	21.16	22.71	29.60	48.94	55.04	66.60	71 72	62.60	55.80	49.50	37.94	25.53
1867	46.91	17.61	30.89	29.72	48.20	51.11	71.61	71.60	69.78	56.60	50.60	40.44	25.31
1868	46.34	19.00	18.72	37.80	43.68	59.08	68.46	77.19	70.33	58.77	45.19	36.77	21.16
1869	46.27	29.38	26.66	27.60	45.70	56.02	64.45	70.35	70.58	63.45	40.80	32.05	28.16
1870	49.11	25.37	24.25	30.28	50.39	64.32	70.87	74.40	70.11	63.66	52.45	38.40	24.80
1871	47.93	24.75	25.65	38.18	50.13	61.39	68.21	70.60	71.19	58.10	53.91	31.95	21.12
1872	45.54	21.59	21.34	24.75	47.39	58.48	71.82	74.91	71.22	62.03	47.44	29.80	15.74
1873	44.54	15.87	19.10	28.30	43.17	56.98	70.60	70.82	69.49	57.38	44.68	28.49	29.54
1874	47.05	27.70	25.51	32.30	36.87	59.58	70.61	72.02	69.39	62.85	49.10	35.00	26.96
1875	43.06	12.87	7.99	26.20	41.11	60.82	66.57	69.67	65.48	58.50	42.93	32.96	31.58
1876	46.17	30.22	27.38	30.55	44.16	57.95	68.14	72.48	71.55	56.50	43.74	36.33	15.23
1877	47.42	18.07	32.31	34.51	46.16	58.25	65.93	71.43	68.46	61.28	50.83	35.24	36.57
1878	48.29	29.11	28.07	40.90	50.55	54.57	64.08	73.04	70.15	63.15	48.33	36.29	21.29
1879	46.88	19.19	20.40	33.19	44.84	58.76	66.02	74.03	70.00	56.21	57.28	38.22	27.46
1880	47.32	37.10	29.19	35.50	45.87	64.30	67.60	68.04	68.58	55.83	46.23	27.52	22.07
1881	48.73	16.98	21.58	30.28	45.59	65.24	64.31	73.43	72.69	69.69	52.51	38.20	34.31
1882	47.57	24.89	35.12	35.96	44.70	52.73	66.49	67.71	69.52	59.98	52.67	36.30	24.80
1883	43.52	14.39	19.76	24.89	43.48	52.98	65.87	68.94	64.90	56.43	46.17	38.08	26.39
1884	45.66	15.46	28.43	29.89	43.66	56.90	68.92	67.95	66.91	65.06	50.91	34.11	24.71
1885	42.90	15.34	8.94	21.26	43.59	55.76	64.69	72.70	63.62	58.94	44.95	37.22	27.75
1886	46.20	18.78	22.27	31.33	50.18	58.06	65.72	70.68	69.30	62.07	52.37	33.94	19.74
1887	46.60	18.20	24.26	28.29	45.37	64.28	68.53	75.51	67.96	58.86	44.97	35.66	27.30
1888	45.03	15.40	21.95	27.03	44.03	53.65	67.89	70.53	67.55	57.76	45.70	38.50	30.39
1889	47.33	28.04	18.25	36.51	46.59	57.37	62.83	70.19	68.56	61.24	44.19	37.39	36.75

EXHIBIT 6.—*Statements of Meteorological Conditions in the Year and in each Month of the Year 1889, Compared with Annual and Monthly Averages for 1888, and for several Stated Periods of Years. These statements and Averages are for Groups of Several Stations in Michigan.*

Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889 More (+), or Less (-), than in 1888.	Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889 More (+), or Less (-), than in 1888.
	No. of Years Averaged, end'g with 1888.	More (+), or less (-), in 1889 than the Average for Previous Years.			No. of Years Averaged, end'g with 1888.	More (+), or Less (-), in 1889 than the Average for Previous Years.	
YEAR 1889.				YEAR 1889.			
				Continued.			
Av. Temp.	12	+1.45°	+2.83°	Cloudiness	12	0	-1 per ct.
Range of Temp.*	12	-6°	-12°	Rainfall	12	-7.75 in.	-1.37 in.
Av. Monthly Range of Temp*	12	-6°	-4°	Atmospheric Pressure	12	-.034 in.	-.030 in.
Av. Daily Range of Temp.*	10	-.76°	+.04°				
JANUARY.				FEBRUARY.			
Av. Temp.	12	+8.34°	+12.25°	Av. Temp.	12	-4.71°	-3.08°
Range of Temp*	12	-16°	-8°	Range of Temp.*	12	-6°	-10°
Av. Daily Range of Temp*	10	-2.47°	-1.35°	Av. Daily Range of Temp.*	10	-.74°	-.38°
Cloudiness	12	+2 per ct.	-3 per ct.	Cloudiness	12	+7 per ct.	+6 per ct.
Rainfall	12	+.27 in.	+.43 in.	Rainfall	12	-.59 in.	+.27 in.
Atmospheric Pressure	12	-.134 in.	-.210 in.	Atmospheric Pressure	12	-.018 in.	+.048 in.
MARCH.				APRIL.			
Av. Temp.	12	+6.71°	+9.94°	Av. Temp.	12	+2.03°	+3.23°
Range of Temp.*	12	-21°	-29°	Range of Temp.*	12	-10°	-16°
Av. Daily Range of Temp.*	10	-1.25°	-.99°	Av. Daily Range of Temp.*	10	-.61°	+.04°
Cloudiness	12	-10 per ct.	-9 per ct.	Cloudiness	12	+3 per ct.	+8 per ct.
Rainfall	12	-1.39 in.	-1.50 in.	Rainfall	12	-.91 in.	-.53 in.
Atmospheric Pressure	12	-.068 in.	-.114 in.	Atmospheric Pressure	12	-.021 in.	-.134 in.
MAY.				JUNE.			
Av. Temp.	12	+.50°	+3.34°	Av. Temp.	12	-2.41°	-4.98°
Range of Temp.*	12	+5°	+9°	Range of Temp.*	12	-6°	-13°
Av. Daily Range of Temp.*	10	-1.44°	+1.24°	Av. Daily Range of Temp.*	10	-2.68°	-3.11°
Cloudiness	12	+6 per ct.	-10 per ct.	Cloudiness	12	+21 per ct.	+25 per ct.
Rainfall	12	+.86 in.	+.48 in.	Rainfall	12	-.15 in.	+.95 in.
Atmospheric Pressure	12	-.166 in.	-.005 in.	Atmospheric Pressure	12	-.011 in.	+.031 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

Comments on Exhibit 6 are printed on pages 15 and 17.

The low temperature for October, the mild weather in January and December, and the small amount of rainfall for the year 1889, are especially noticeable.

EXHIBIT 6.—CONTINUED.—*Meteorological Conditions at Stations in Michigan, in Months for the Year 1889, Compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889 More (+), or Less (-), than in 1888.	Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889 More (+), or Less (-), than in 1888.
	No. of Years Averaged, end'g with 1888.	More (+), or Less (-), in 1889 than the Average for Previous Years.			No. of Years Averaged, end'g with 1888.	More (+), or Less (-), in 1889 than the Average for Previous Years.	
JULY.				AUGUST.			
Av. Temp.	12	-.09°	-.26°	Av. Temp.	12	+.59°	+.53°
Range of Temp.*	12	+3°	+4°	Range of Temp*	12	-3°	-4°
Av. Daily Range of Temp.*	10	+.54°	+.52°	Av. Daily Range of Temp.*	10	+1.52°	+1.29°
Cloudiness	12	-5 per ct.	-8 per ct.	Cloudiness	12	-11 per ct.	-12 per ct.
Rainfall	12	-.31 in.	+1.05 in.	Rainfall	12	-2.35 in.	-1.40 in.
Atmospheric Pressure	12	-.020 in.	-.062 in.	Atmospheric Pressure	12	+.041 in.	+.048 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.	12	+.29°	+3.16°	Av. Temp.	12	-5.31°	-1.42°
Range of Temp.*	12	+3°	+6°	Range of Temp.*	12	-4°	+12°
Av. Daily Range of Temp.*	10	+.79°	+.26°	Av. Daily Range of Temp.*	10	-.28°	+2.40°
Cloudiness	12	-4 per ct.	+2 per ct.	Cloudiness	12	0	-9 per ct.
Rainfall	12	-1.61 in.	-.81 in.	Rainfall	12	-2.87 in.	-1.58 in.
Atmospheric Pressure	12	-.065 in.	-.043 in.	Atmospheric pressure	12	+.039 in.	+.158 in.
NOVEMBER.				DECEMBER.			
Av. Temp.	12	+1.76°	-.78°	Av. Temp.	12	+9.74°	+6.03°
Range of Temp.*	12	-15°	-9°	Range of Temp.*	12	-4°	+9°
Av. Daily Range of Temp.*	10	-2.77°	-1.66°	Av. Daily Range of Temp.*	10	+.24°	+2.13°
Cloudiness	12	+4 per ct.	+8 per ct.	Cloudiness	12	-13 per ct.	-9 per ct.
Rainfall	12	0	+.18 in.	Rainfall	12	+.26 in.	+1.07 in.
Atmospheric Pressure	12	-.043 in.	-.067 in.	Atmospheric Pressure	12	-.040 in.	-.002 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1889, IN MICHIGAN.

At the several meteorological stations, in different parts of the State, the average temperature for 1889 was 1.45° higher than the average for the preceding 12 years; the annual range of temperature was 12° less than in 1888, and 6° less than the annual average range for the preceding 12 years; the average monthly range of temperature was 4° less than in 1888 and 6° less than the average for the preceding 12 years; the average daily range of temperature .04° less than in 1888 and .76° less than the average for the preceding 10 years; the average cloudiness was 1 per cent less than in 1888 and the same as the average for the preceding 12 years; the rain-

[See page 17.]

EXHIBIT 7.—*Statements of Meteorological Conditions in the Year and in each Month of the Year 1889, Compared with Annual and Monthly Averages for 1888, and for several stated Periods of Years—from Observations by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Meterological Conditions.	1889, Compared with Averages for Previous Years.		In 1889	Meterological Conditions.	1889, Compared with Averages for Previous Years.		In 1889
	No. of Years Averaged, endi'g with 1888.	More (+), or Less (-), in 1889 than the Average for Previous Years.	More (+), or Less (-), than in 1888.		No. of Years Averaged, endi'g with 1888.	More (+), or Less (-) in 1889 than the Average for Previous Years.	More (+), or Less (-), than in 1888.
YEAR 1889.				YEAR 1889.			
Av. Temp.	25	+.93°	+2.30°	*Continued.*			
Range of Temp.*	16	-5°	-6°	Cloudiness	25	-2 per ct.	-2 per ct.
Av. Monthly Range of Temp.*	16	-3°	-1°	Rainfall	25	-7.92 in.	-2.48 in.
Av. Daily Range of Temp.*	15	-.59°	+.62°	Atmospheric Pressure	14	-.004 in.	-.046 in.
JANUARY.				FEBRUARY.			
Av. Temp.	25	+6.77°	+12.64°	Av. Temp.	25	-5.45°	-3.70°
Range of Temp.*	16	-11°	-4°	Range of Temp.*	16	-3°	-7°
Av. Daily Range of Temp.*	15	-1.85°	-2.52°	Av. Daily Range of Temp.*	15	+2.14°	+1.56°
Cloudiness	25	-2 per ct.	-6 per ct.	Cloudiness	15	+9 per ct.	+9 per ct.
Rainfall	25	-.33 in.	-.65 in.	Rainfall	25	-.92 in.	-.53 in.
Atmospheric Pressure.	14	-.090 in.	-.207 in.	Atmospheric Pressure	14	+.019 in.	+.021 in.
MARCH.				APRIL.			
Av. Temp.*	25	+5.71°	+9.48°	Av. Temp.	25	+.95°	+2.56°
Range of Temp.*	16	-8°	-10°	Range of Temp.*	16	-7°	-5°
Av. Daily Range of Temp.*	15	+1.42°	+2.04°	Av. Daily Range of Temp.*	15	-.98°	-.07°
Cloudiness	25	-11 per ct.	-11 per ct.	Cloudiness	25	°	+7 per ct.
Rainfall	25	-1.31 in.	-.66 in.	Rainfall	25	-.84 in.	+.87 in.
Atmospheric Pressure	14	-.016 in.	-.143 in.	Atmospheric Pressure	14	+.026 in.	-.141 in.
MAY.				JUNE.			
Av. Temp.*	25	-.79°	+3.72°	Av. Temp.	25	-4.86°	-5.06°
Range of Temp.*	16	+3°	+4°	Range of Temp.*	16	-5°	-7°
Av. Daily Range of Temp.*	15	-4.02°	+0.19°	Av. Daily Range of Temp.*	15	-4.85°	-2.70°
Cloudiness	25	+1 per ct.	-12 per ct.	Cloudiness	25	+16 per ct.	+21 per ct.
Rainfall	25	+.51 in.	-.05 in.	Rainfall	25	-.40 in.	+1.21 in.
Atmospheric Pressure	15	-.042 in.	-.027 in.	Atmospheric Pressure	15	-.001 in.	+.005 in.

*By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

Comments on Exhibit 7 are printed on page 18.

The low temperature for February, the mild weather in January and December, and the small amount of rainfall for August and September are especially noticeable.

fall (rain and melted snow) was 1.37 inches less than in 1888 and 7.75 inches less than the average for the preceding 12 years; the average atmospheric pressure was .030 of an inch less than in 1888 and .034 of an inch less than the average for the preceding 12 years.

In Exhibit 6, pages 14 and 15 is given by year and months, a comparison of conditions in 1889, in Michigan, with those in 1888, and with the averages for periods of years. December, January, March, April, November, August, May and September (naming the months in the order of greatest difference) were the months in which the average temperature in 1889 was higher than the average for corresponding months in the preceding 12 years; October, February, June and July were months in which the average temperature in 1889 was lower than the average for corresponding months in the preceding 12 years.

EXHIBIT 7.—CONTINUED.—*Meteorological Conditions at the Agricultural College, in Months, for the Year 1889, compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889, More (+), or Less (-), than in 1888.	Meteorological Conditions.	1889 Compared with Averages for Previous Years.		In 1889, More (+), or Less (-), than in 1888.
	No. of Years Averaged, ending with 1888.	More (+), or Less (-), in 1889, than the Average for Previous Years.			No. of Years Averaged, ending with 1888.	More (+), or Less (-), in 1889, than the Average for Previous Years.	
JULY.				AUGUST.			
Av. Temp.	25	-1.40°	-.34°	Av. Temp.	25	-.16°	+1.01°
Range of Temp.*	16	-5°	-1°	Range of Temp.*	16	-2°	-3°
Av. Daily Range of Temp.*	15	-2.08°	-1.42°	Av. Daily Range of Temp.*	15	+1.14°	+2.01°
Cloudiness	25	-4 per ct.	-1 per ct.	Cloudiness	25	-14 per ct.	-10 per ct.
Rainfall	25	+.07 in.	+1.01 in.	Rainfall	25	-2.09 in.	-1.19 in.
Atmospheric Pressure	14	-.001 in.	-.062 in.	Atmospheric Pressure	14	+.068 in.	+.038 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.	25	+1.00°	+3.48°	Av. Temp.	25	-4.08°	-1.51°
Range of Temp.*	16	+11°	+11°	Range of Temp.*	16	-1°	+9°
Av. Daily Range of Temp.*	15	+3.09°	+.86°	Av. Daily Range of Temp.*	15	+2.90°	+7.23°
Cloudiness	25	-9 per ct.	-5 per ct.	Cloudiness	25	+5 per ct.	-6 per ct.
Rainfall	25	-2.26 in.	-1.10 in.	Rainfall	25	-1.95 in.	-2.35 in.
Atmospheric Pressure	14	-.044 in.	-.058 in.	Atmospheric Pressure	14	+.072 in.	+.130 in.
NOVEMBER.				DECEMBER.			
Av. Temp.	25	+1.95°	-1.11°	Av. Temp.	25	+11.15°	+6.36°
Range of Temp.*	16	-8°	-12°	Range of Temp.*	16	-8°	+5°
Av. Daily Range of Temp.*	15	-3.63°	-3.27°	Av. Daily Range of Temp.*	15	-.37°	+2.74°
Cloudiness	25	+5 per ct.	-10 per ct.	Cloudiness	25	-21 per ct.	-17 per ct.
Rainfall	25	+.41 in.	-.45 in.	Rainfall	25	+.68 in.	+1.41 in.
Atmospheric Pressure	14	-.023 in.	-.106 in.	Atmospheric Pressure	14	-.023 in.	-.007 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1889, AT ONE CENTRAL STATION.

At the State Agricultural College, and near Lansing, near the center of the thickly-settled part of the State, the average temperature for 1889 was 2.30° higher than for 1888, and .93° higher than the average for the preceding 25 years; the annual range of temperature was 6° less than in 1888 and 5° less than the annual average range for the preceding 16 years; the average monthly range of temperature was 1° less than in 1888, and 3° less than the average for the preceding 16 years; the average daily range of temperature was .62° more than in 1888, and .59° less than the average for the preceding 15 years; the average cloudiness was 2 per cent less than in 1888, and the same as the average for the preceding 25 years; the rainfall (rain and melted snow) was 2.48 inches less than in 1888, and 7.92 inches less than the average for the preceding 25 years; the average atmospheric pressure was .046 of an inch less than in 1888, and .004 of an inch less than the average for the preceding 14 years.

In Exhibit 7, pages 16 and 17, is given by year and months, a comparison of conditions in 1889, at the Agricultural College, with those in 1888, and with averages for periods of years. December, January, March, November, September and April (naming months in order of greatest difference) were months in which the average temperature in 1889 was higher than average for corresponding months in the preceding 25 years; February, June, October, July, May and August were months in which the average temperature in 1889 was lower than the average for corresponding months in the preceding 25 years, at that station, which is near the central part of the State.

Whoever will carefully study Diagram No. I (p. 30) in this article and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the temperature at a station in the central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes, for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1889.

The following general remarks relative to temperature, frosts, effects on

vegetation, migration of birds, etc., in 1889, are taken from the monthly reports by observers. The names of observers are stated in Exhibit 1, page 10.

JANUARY.

Jan. 11, first day temperature below zero; 14, trees loaded with frost in the morning; 15, snow on the ground, 11 inches; 31, snow on the ground, 10 inches.—*Gulliver Lake.*

Depth of snow on ground Jan. 15, 3 inches; 31, 8 inches.—*Traverse City.*

Melting snow on the ground, Jan. 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 23, 24, 25, 28, 29. Bay and river clear of ice from the 1st to the 10th. There was floating ice in bay and river from the 10th to the 14th. Bay and river frozen over from the 15th to 31st.—*Alpena.*

Jan. 1: ¾ inch snow. Jan 7: The ground slightly covered with snow. Jan. 9: 1¾ inch snow fell during night. Jan. 13: There is but very little ice in the lake and but very little frost in the ground. About 8½ inches of snow has fallen during the month. About 4 inches now on the ground.—*Port Austin.*

Jan. 23: Snow melting rapidly. Jan. 24: Snow continued melting, very little on ground at close of the day. Jan. 31: Depth of snow on ground at close of month (estimated), 3.6 inches.—*Port Huron.*

Inappreciable snow, Jan. 13, 14, 18, 21. Snow that melted as it fell, Jan. 6. Lowest barometer pressure ever known, Jan. 9. January was an unusually mild month for the season, the mean temperature being about 6° above the normal. There was no sleighing; the first snows melted and drifted and the last were insufficient. Ice in the ground and on ponds is about six inches, running water not being frozen. The month is notable for the lowest barometric pressure ever observed at this station, less than 28 inches (27.92). As the month closes, the wheat fields are quite well protected with snow.—*Thornville.*

Jan. 8: Sudden and remarkable fall of barometer in night. Jan. 15: No snow on the ground at this date. Jan. 31: About two inches of snow on the ground.—*Ann Arbor.*

Before the storm of Jan. 9, the barometer fell forty one-hundredths of an inch, and reached 28,000, the lowest ever known at this point. There was no snow on the ground at the middle of the month, and but two inches at the close. No sleighing thus far during the winter. Wheat has suffered somewhat, but not so much as it would had the ground thawed out. There was no break up during the month. The first sleighs appeared on Jan. 20, for one day only.—*Hudson.*

Jan. 15: No snow. Jan. 31: 5 inches.—*Tecumseh.*

Bees out Jan. 2 and 24.—*Parkville.*

The pleasant weather reported for Dec. continued during the greater part of Jan. The most disagreeable winds came from the south.—*Birmingham.*

Frosts occurred Jan. 1, 2, 3, 4 and 24. About 2 inches snow on ground at end of month.—*Lansing.*

FEBRUARY.

Feb. 15: Snow 12 inches in fields. Feb. 16: Very severe ice storm, ice remained on trees till Feb. 25.—*Gulliver Lake.*

Feb. 18: Grand Traverse Bay (West Arm) froze over. Feb. 15: Depth of snow on the ground, 20 inches; Feb. 28, 24 inches.—*Traverse City.*

Cold waves passed this station Feb. 1, 5, 12 and 22.—*Alpena.*

Fifteen inches of snow on the ground Feb. 28.—*Harrisville.*

Melting snow on the ground Feb. 16, 21, 27 and 28. Heavy ice on river from Feb. 8 throughout the month.—*Grand Haven.*

Feb. 8: The hardest snow and wind-storm I have witnessed at this place in 30 years. As near as can be got at, the snow fell 8 to 10 inches deep. Feb. 26: There have been a number of light snow falls, but too little and too much drifted to keep a measurement of. About 12 inches on the ground now.—*Port Austin.*

Feb. 21: Snow on ground melting rapidly. Feb. 28: Snow thawed rapidly all day.—*Port Huron.*

Inappreciable snow Feb. 1, 3, 7, 8, 9, 12 and 25. A cold winter month in unexpected and sharp contrast with the mildness of Jan. Sleighing after the 18th, but not first-rate. Ice on the ponds about 12 inches, and rather more in the ground in exposed places. Mercury below zero all day Feb. 23. Thawy days, Feb. 21 and 26.—*Thornville.*

Feb. 15: Snow in patches on ground at this date. Feb. 28: Ground bare in places, especially on southern slopes. Snow is perhaps an inch and a half deep on an average.—*Ann Arbor.*

Feb. 15: 5 inches of snow. 28: 3½ inches.—*Tecumseh.*

The hard freezing during the latter part of this month has killed all the fruit buds on the peach trees. Wheat has been covered with snow during the greater part of this month.—*Birmingham.*

Bees out on Feb. 13 and 27.—*Parkville.*

Heavy frost Feb. 10 and 14. Hoar frost Feb. 28.—*Lansing.*

MARCH.

March 3: Trees loaded with ice from frozen fog and mist. March 4: Heavy white frost. March 12: Manistique river, harbor and Lake Michigan open. Bluejays appeared, owls hooting in evening. March 15: Snow on ground, 9½ inches. Phœbe and chipping birds appeared. March 16: First day minimum temp. above 32°. March 19: Snow melting fast. March 23: Heavy white frost. March 31: Snow on the ground, trace only. Ice on Gulliver Lake, 6 inches.—*Gulliver Lake.*

Robins arrive March 15. Ice goes out of west arm of Grand Traverse Bay March 30.—*Traverse City.*

March 3: Flock of wild geese observed flying north.—*Alpena.*

Melting snow on ground March 2, 3, 4, 5, 6, 7, 11, 12, 13, 14, 15, 30 and 31.—*Grand Haven.*

March 16: Snow all gone except drifts. March 18: Two steamers passed up.—*Port Austin.*

March 3: Snow on ground melted rapidly. March 31: Snow on ground at close of day, 5 inches.—*Port Huron.*

Inappreciable snow, March 8, 9 and 10. Nights that did not freeze, March 23 and 26. Movements of migratory birds: Robins first seen March 10. Robins numerous March 16. Blue birds, killdeer and plover first seen March 15. Bluebirds numerous March 16. Blackbirds first seen March 15; numerous March 17. Song sparrows first seen March 16. Meadow-larks first seen March 26. Grass and wheat began to look green March 17. First streaked snake March 17. No frogs were heard by me during the month others claim to have heard them. March was warmer than the normal by 4 or 5 degrees, and very dry The drought and the repeated freezing and thawing has damaged the wheat, but to what extent cannot be told. Peach tree buds are mostly killed, but apples are all right. A little plowing was done before the snow storms, but no grain sowed. Clover seed generally sowed.—*Thornville.*

Melting snow on ground, March 1, 8, 30 and 31. The weather beautiful during most of month; roads dry and dusty.—*Alma.*

March 15: No snow on ground, and ground seems to be thawed out.—*Ann Arbor.*

No snow on the ground March 15. Bluebirds and meadow-larks made their appearance March 4. Wheat is looking very poorly on account of the dryness of the month. Wells and cisterns are dry.—*Hudson.*

March 14: Birds singing this morning. March 18, 6:30 P. M.: A large flock of crows settling in the trees.—*Kalamazoo.*

March 15: No snow. March 31: 1¼ inches snow.—*Tecumseh.*

The weather during this month has been pleasant and monotonous. A severe drought has prevailed during nearly the entire period, which has affected wheat injuriously, and caused a water famine in some localities, the wells and cisterns having gone dry. Considerable plowing and grain sowing have been done.—*Birmingham.*

Spring birds on March 1; wild geese, March 9; robins on March 11. The ground has been about bare all the month, with low temperature and some heavy frosts.—*Parkville.*

Light frosts, March 3, 4, 11, 15, 20 and 23; heavy frosts, March 18, 19 and 30. March 10: Robin seen. March 15: Ice went out of Grand river. March 15: Blackbirds (*Quiscalus versicolor*) seen. March 16: Bluebirds (*Sialis Wilsonii*) seen.—*Lansing.*

March 15: Mercury 58° in the shade and most of the ice is off the river.—*D. W. Palmer, M. D., River Raisin.*

APRIL.

White frosts, April 1, 10, 12, 14, 15 and 22. Temperature of Gulliver Lake at 7 A. M.: April 15, 40°; 16, 40°; 18, 45°; 21, 45°; 22, 46°. 7 P. M.: April 14, 48°; 15, 42°; 16, 47°; 17, 48°; 19, 51°; 21, 48°; 22, 51°; 23, 47°; 24, 46°; 25, 45°; 29' 42°; 30, 43°. April 2: Elder sprouting. April 4: Song sparrows. April 8: Frogs first heard; water over ice on Gulliver Lake. April 9: First butterflies. April 10: First robins and blackbirds. April 11: First bluebirds. April 14: Gulliver Lake open; water in lake is 18 inches lower than when ice broke up in 1888. April 15: Spring beauties in blossom. April 18: Arbutus in blossom. April 19: First thunder shower. April 22: Flock geese north.—*Gulliver Lake.*

Martins arrive on April 19.—*Traverse City.*

Melting snow on the ground April 1, 3, 6 and 29. Navigation opened April 5; the first boat of the season, Steamer Atlantic, Captain Jones, from Detroit, laden with merchandise, arrived at this port at 7 o'clock on the morning of the 5th. Light frosts April 15, 16, 17, 22, 27.—*Alpena.*

Melting snow on ground April 1.—*Grand Haven.*

April 2: Light-house lighted up. April 5: One inch of snow fell in the night; have not had rain to settle the dust during the month; the water has fallen since Oct. 1, 1888, from 1 ft. 8 inches to 2 ft. 10, measurement taken from a pin set in the rock by a U. S. surveyor, as many as 10 years since.—*Port Austin.*

Nights that did not freeze, April 2, 7, 8, 10, 11, 18, 19 and 25. Inappreciable snow, April 29. Progress of vegetation: Juneberry in blossom, April 9; crocuses, April 16; lilacs and raspberries leafing, April 19;

willows in blossom, April 19, leafing, April 24; apple trees leafing, April 21. Movements of migratory birds: Phœbe birds seen April 8; cheewink, April 9; catbirds, April 25. Frogs first heard April 8. April was a cold, dry month, but in spite of unfavorable conditions, wheat made a very fair growth; grass not so good. Wheat and clover are some injured bp the winter; perhaps not more, however, than the average amount one year with another. Wheat looks fair, clover and grass are backward; peach buds about all killed; other kinds of fruit all right.—*Thornville.*

Light frost on the night of April 30; disappeared from the ground about 8 o'clock on the following morning.—*Alma.*

Wheat is looking quite thrifty on heavy soil, but is thin and weak on light grounds; the small amount of rainfall during the month has not been sufficient to give it a good start; from the appearance now I would suppose a half crop would be about the average for this section. Season is cold and backward; trees have not leaved out yet, but buds are ready to burst on most forest, as well as fruit trees. Ice formed ⅛ of an inch on the 30th at night, and a heavy frost.—*Hudson.*

April 6, 9 A. M.: Wild geese high up flying north.—*Kalamazoo.*

Considerable freezing during first part of month, doing damage to early sown grain. Droughty.—*Birmingham.*

Frosts observed April 7, 10, 14 and 15. April 22: Commenced mowing capitol lawn.—*Lansing.*

MAY.

Temperature of Gulliver Lake May 1, 45°; 9, 60°; 18, 60°; 28, 48°; 29, 46°. Frosts May 2 and 25. Hard frost May 28. May 29: Ground frozen.—*Gulliver Lake.*

Light frost formed on the 3d; heavy frost formed on the 23d; material damage done to vegetation. Light frost on May 25, doing considerable damage to tomatoes and cucumbers. Frost on 26th, no damage. On the 28th a heavy frost formed, doing great damage to vegetation and shade trees. Heavy frost on May 29, doing great damage to tomatoes and potatoes.—*Alpena.*

Frosts, light, May 1, 3, 25 and 26; heavy on May 28; considerable damage done to fruits and vegetables. —*Grand Haven.*

May 10: Very dry. May 21: A slight frost. May 28: A frost cut some of the vegetables. May 30: The growth of vegetation very backward.—*Port Austin.*

Light frost, May 1. Killing frost, May 3 and 23.—*Port Huron.*

Frosts, May 3, 23, 25, 26, 28 and 29. Snow storm May 29, very wet and heavy, beginning at 4 P. M., much melted as it fell, more than an inch of slush on the ground next morning. Gale of wind May 30, in the morning, blew down apple trees. Driest day ever noted, May 4, mean relative humidity, 39. Progress of vegetation: Sugar maple leafing, May 4; plum and cherry in blossom, red oak leafing, May 7 and 8; locust leafing and apple trees in blossom, May 9; white oak leafing, May 11; locust in blossom, May 30. Movements of migratory birds: Baltimore oriole, king birds and barn swallows arrived May 7; bobolinks and yellow finch, May 10; cuckoo first heard, May 21. May was a month of extreme drought till near its close, and then went to the other extreme. The storm of May 29 and 30 gave the largest precipitation ever noted here, although there have been days with greater rainfall than either one of this storm. The rain turned to snow about 4 P. M. of May 29, and fell with great rapidity till in the night; if none had melted there would have been at least six inches in all. The weight of it broke the apple trees some; it did not all disappear till noon the next day; it flattened the wheat pretty badly, but that is coming up again. The frosts did not do very much hurt; early planted potatoes are about all, not much of the corn being up, and the wheat not headed out. It is not thought that apples, cherries, or any fruit except strawberries are injured in the least.—*Thornville.*

Frosts occurred May 1, 3, 23, 25, 26, 28 and 29.—*Alma.*

Frost, May 1, 3, 28.—*Albion.*

Light frost May 3 and 26. May 30, snow ½ inch.—*Battle Creek.*

Frosts occurred on mornings of May 3, 23 and 28. A notable feature of the spring months has been the absence of thunder storms, only two having been recorded at this station. The storm of May 29, 30 and 31 showed a greater rainfall than any storm in 13 years.—*Hudson.*

May 22, between 12 at night and 1 A. M.: Snow, heavy flakes.—*Kalamazoo.*

May 1: Frost and frozen ground. May 3: Heavy frost. Great drought during first half of the month, the last half has been cold, which has kept spring crops backward. Heavy frost on morning of May 22 which did great damage to tender vegetation. The month has been generally disagreeable. Physicians say there has been a prevalence of malarial sickness.—*Birmingham.*

Ice formed on May 1, 3 and 28; light frost on May 23 and 25; frost killed vegetables on May 28.—*Parkville.*

May 1: White frost in the morning. May 3: White frost in the morning. Lombard plums in full bloom. May 4: Morello cherries in full bloom. May 6: Pear trees in full bloom. May 7: Siberian crabs in full bloom. May 8: Baltimore oriole appeared. May 12: Red birds and whip-poor-wills heard. May 23: Killing frost in low places in morning. May 25: White frost in morning. May 28: Killing frost and ice in small vessels of water. May 30: Snow fell during the night, probably 1½ inches, judging from the half melted snow in the grass and on the wood walks.—*Lansing.*

JUNE.

June 17: Temperature of Gulliver Lake, 65°.—*Gulliver Lake.*

The water has risen 9 inches during the month.—*Port Austin.*

Progress of vegetation: June 8: Wheat heading out; June 17: June clover in blossom; June 19: Barley heading out; June 29: Haying begins. June was wet and cold during the first half of the month, and dry and cool (except a few days) during the latter half, making very unfavorable weather for corn and grass. Wheat and all other crops made satisfactory growth and promise well. Whether the "green midge" will hurt the wheat much is uncertain yet; it is very thick on it.—*Thornville.*

Hail storm June 16, 11:30 A. M.—*Albion.*

Green midge is reported as plenty throughout the county, cannot say what the damage may be from its presence. Potatoes are unusually fine, the cool, wet weather for the past month being favorable to them, while the reverse for corn. Haying has commenced in this county; ground is in good condition to stand a dry spell, should July prove so.—*Hudson.*

The early part of June was cold and disagreeable, the latter part hot and dry. Vegetation has been backward during the entire month. Corn is four weeks late. During the latter part of May and the fore part of June, insects were scare, in consequence of which, and the damp, cold weather, great numbers of young birds have starved or chilled to death in their nests.—*Birmingham.*

Light frost on June 6. Low temperature all the fore part of this month.—*Parkville.*

June 23, frost in morning.—*Lansing.*

JULY.

July 1: Temperature of Gulliver Lake, 77°.—*Gulliver Lake.*

July 1: The water has fallen 9½ inches since June 1, 1889. July 10: Began to cut hay.—*Port Austin.*

Progress of vegetation: Wheat harvest began July 15, ended July 24; corn tasseling, July 21; oat harvest began July 30. Gale of wind July 27, with the rain at 9 P. M., blew down chimneys, fruit trees, tipped over covered buggies and Wixom's show tent. There were no serious accidents; the folks in the tent ran out before it blew away, only two or three being caught inside. There was great alarm for a little while, children being separated from their parents, but no one was hurt much. A dry month with generally hot days and cool nights, quite favorable for harvest: the straw of the wheat is rusty.—*Thornville.*

July 30, P. M.: Thunder storm, rain with considerable hail.—*Ann Arbor.*

Aside from excessive drought and high temperature, the weather for this month has been very monotonous.—*Birmingham.*

July 27: Hailed at 8:30 P. M. Oats, barley and corn much injured by wind and hail. The storm was much more severe a few miles west of station; barns, fences and trees blown down. August crickets began chirping July 28.—*Lansing.*

AUGUST.

Aug. 2: Tornado formed over Gulliver Lake, but did not reach the ground. Aug. 4: Temperature of Gulliver Lake, 63° at 7 P. M. Frost at Manistique, Aug. 5. Temperature of Gulliver Lake, 62° at 7 A. M.—*Gulliver Lake.*

Rain, snow, hail or sleet fell on 1 cloudless day, 5 partly cloudy, and 3 cloudy days.—*Grand Haven.*

Katydids first heard Aug. 8. August was a month of drought, a continuation of the dry weather that began about the middle of July. Water seems to be about the lowest ever known, although we have had longer droughts than this. All hoed crops, buckwheat, pastures and seeding feel the effects of it seriously. The damage is immense. It is the worst drought that was ever known here.—*Thornville.*

The dryest month at this station for 10 years; grass and corn all drying up.—*Hudson.*

SEPTEMBER.

Sept. 3: Temperature Gulliver Lake, 69.5°. Sept. 16: Frost north of Gulliver Lake. Sept. 22: Frost, first day temperature below 32°; temperature Gulliver Lake, 50° at 7 A. M.—*Gulliver Lake.*

Light frost Sept. 16, 28 and 29; heavy frost Sept. 22. Very small hail fell on Sept. 26 from 7:57 to 8:03 P. M.—*Manistee.*

The first light frost of the season occurred on the 17th; no damage known to have been done. The first

heavy frost of the season occurred on Sept. 22. Cucumbers, squashes and other vegetables were much damaged by this frost. Frost also occurred on Sept. 27 and 28. No material damage known to have been done.—*Alpena.*

Sept. 16: We had a slight frost, none to damage vines or corn. The month has been dry and pleasant.—*Port Austin.*

Sept. 22: Light frost during night. Sept. 27: Heavy frost during night.—*Port Huron.*

Frosts: Sept. 21: Light, little damage done; Sept. 22: Heavy, killed corn and all tender vegetables. Heavy frost, Sept. 27. Movements of migratory birds: Barn swallows were gone Sept. 1; cat-birds and thrushes soon after—about Sept. 5: blackbirds, Sept. 15; young blackbirds, Sept. 25; yellowbirds, robins and bluebirds still going. Sept. was a continuation of the Aug. drought. The little rain we had served to make the sowed wheat come up, but was insufficient to make the fall pasturage grow. Cattle are quite generally fed something—cornstalks, roots or provender. Wells are failing beyond all precedent.—*Thornville.*

First frost, heavy, Sept. 22.—*Alma.*

Frost, Sept. 20, 21 and 22.—*Albion.*

Frost, Sept. 21 and 22.—*Ann Arbor.*

Light frost, Sept. 17 and 18; heavy frost, Sept. 21 and 22. Ice ⅛ inch thick morning Sept. 22. Very dry month, but nothing suffering. Potato crop large, and potatoes as fine and in as good condition as ever known in this sec'ion.—*Hudson.*

First frost, Sept. 19. Ice formed Sept. 19, 21 and 22.—*Parkville.*

Sept. 17: Scattering flakes of snow falling at 7 P. M. Sept. 21: Light frost, first of the season. Sept. 22: Heavy frost, killing; water froze in instrument shelter. Sept. 27: Killing frost.—*Lansing.*

OCTOBER.

Frosts, Oct. 2, 4, 6, 8, 9, 10, 13, 14, 15, 17, 21, 22 and 23. Maple leaves commenced to turn yellow Oct. 4. Oct. 6: Sleet squalls, 9 A. M. to 3 P. M. Oct. 9: Large flocks geese south at 5 and 9 P. M. Oct. 13: Ground frozen ¼ inch. Oct. 14: Temperature Gulliver Lake, 41.5° at 7 A. M. Oct. 20: Temperature Gulliver Lake, 42° at 7 A. M. Light flurry snow, 1 to 5 P. M. Oct. 21: Temperature Gulliver Lake, 37° at 7 A. M. First day average temp. below 32°. Oct. 25: 2 large flocks geese south in afternoon. Oct. 26: Very large flock geese south at 9 A. M., ¼ mile long by ⅛ mile wide.—*Gulliver Lake.*

Frosts Oct. 2 and 6.—*Manistee.*

Frost formed on Oct. 8. Sleet fell during night of Oct. 6-7. The first snows of the season fell on Oct. 6 and 22; the fall was too small to measure.—*Alpena.*

Oct. 13: A very slight frost. Oct. 31: We have had but very little frost in the month—very dry.—*Port Austin.*

Flakes of snow flying Oct. 6. Frosts occurred Oct. 7, 8, 10, 15, 16, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29 and 30. Movements of migratory birds: Yellow birds left Oct. 4; last phœbe seen Oct. 11; last blackbird, Oct. 14; wild geese went south Oct. 21; last robin seen Oct. 25. Oct. was a continuation of the drought that is the characteristic feature of the year. The little rain that fell was not sufficient to make the late sown wheat all come up, and it is very spotted. The fall pasturage is nothing, and cattle have been fed some quite generally. Corn husking is nearly finished: there is scarcely a third of a crop. Unless we have a late fall with warm rains, the wheat must go into winter quarters with very small top.—*Thornville.*

A great amount of smoke during the month, it being sometimes almost impossible to see twenty feet. It began Oct. 16, and was dispersed by rain Oct. 25.—*Alma.*

Frost, Oct. 4, 7, 8, 10, 14, 15, 16, 18, 19, 21, 23, 24, 28 and 29. Smoke very oppressive from evening of 19th through 21st. Sun almost completely obscured.—*Albion.*

Oct. 6: A few flakes of snow observed about 4 P. M.—the first of the season.—*Ann Arbor.*

Ice formed mornings of Oct. 7 and 8.—*Hudson.*

Heavy frost on Oct. 8, which killed all tender vegetation. Much smoke from burning marshes during the entire month. Very dry.—*Birmingham.*

Wild geese Oct. 21.—*Parkville.*

Killing frosts, Oct. 4, 7, 8, 10, 14, 18, 23, 24 and 29; light frost Oct. 15. Wild geese flying south Oct. 10.—*Lansing.*

NOVEMBER.

Frosts, Nov. 4, 7, 8, 9, 15, 16, 17, 18, 19, 25, 26, 29 and 30. Nov. 4: Geese flying south in morning. Nov. 5: Last robin. Nov. 9: First ice in Gulliver Lake, ¼ inch near shore in morning. Nov. 12: First snow, enough to measure. Nov. 14: First day maximum temp. below 32°. Nov. 15: Gulliver Lake frozen across, ice ¼ inch thick. Nov. 16: Ice broke up in lake. Nov. 18: Gulliver Lake frozen across. Nov. 21: Lake open. Nov. 26: Gulliver Lake frozen across. Nov. 27: Lake open. Nov. 28: Gulliver Lake frozen across. Nov. 30: Ice on Gulliver Lake, 2 inches.—*Gulliver Lake.*

Melting snow on the ground Nov. 30; ground frozen about 3 inches.—*Alpena.*

Total depth of snowfall, 8.5 inches.—*Grand Haven.*

Nov. 14 and 22: A little snow. Nov. 27 and 28: Heavy rain, and snow about 5 inches.—*Port Austin.*

Nov. 15: Snow melted rapidly during day.—*Port Huron.*

Nights that did not freeze, Nov. 1, 2, 3, 8, 9, 11, 12, 13, 18, 19, 20, 22, 23 and 24. Wild geese went south Nov. 7. Nov. was quite warm and favorable for work till the snow came on the 26th; then it was severe winter till the close of the month. Wheat made better growth according to the season than in October There is about 6 inches of snow on the ground and no frost under.—*Thornville.*

Frost Nov. 4, 6, 7, 16 and 17.—*Albion.*

A few flakes of snow Nov. 5 and 15.—*Ann Arbor.*

First snow of the season fell on Nov. 27, 4 inches. Hail, Nov. 14. Frost, Nov. 26.—*Hudson.*

Nov. 30: Depth of snow, 3½ inches.—*Tecumseh.*

Winter set in Nov. 26. Snow on ground, 5 inches.—*Parkville.*

Light frost, Nov. 3 and 25. Heavy frost, Nov. 6, 15, 16, 17 and 26. River froze over for first time this season, Nov. 26.—*Lansing.*

DECEMBER,

Dec. 31: Snow on ground 1 inch. Ice on Gulliver Lake 6 inches thick.—*Gulliver Lake.*

Warm weather. On Dec. 14, 20 and 21, days on which snow is recorded, snow melted very soon after it had fallen. Ground yet unfrozen.—*Manistee.*

Frost formed Dec. 1, 6, 10, 12, 27 and 31. Melting snow on ground, Dec. 2, 5, 6, 15, 16, 20, 23 and 29. The lake, bay and river clear of ice.—*Alpena.*

Melting snow on ground Dec. 20.—*Grand Haven.*

Dec. 11: Steam barge passed. Dec. 14: Plow still going. Dec. 16: A little snow, ½ inch. There was no snow on the first and none on the last day of the month. The ground has been hardly white during the month, and but very little frost.—*Port Austin.*

Nights that did not freeze, Dec. 7, 10, 12, 17, 18, 19, 21 and 22. Frozen rain, Dec. 5 and 14. Dec. was a very mild month—10 or 12° above the normal, with a good rainfall and much pleasant weather. There was no snow. Wheat made considerable growth, and some plowing was done. At the close there is a mere skim of ice in the ground and on still water, but running is wide open.—*Thornville.*

Have had no appreciable snow during month.—*Ann Arbor.*

A very remarkable month for this section; no snow during the month; a good many pleasant days and no severe weather. Heavy frosts Dec. 23 and 30.—*Hudson.*

Dec. has been a remarkably warm month. Wheat and grasses have grown more during this month than they did during the autumn months. Potatoes have sprouted in pits and cellars.—*Birmingham.*

Bees were out Dec. 2, 6, 9, 12, 19, 25, 28 and 29. Bare ground all the month—regular April weather.—*Parkville.*

Dec. 8: Ice went out of Grand river. Heavy frost Dec. 9, 19, 23, 28 and 31.—*Lansing.*

METEORS.

April 20, 8:30 P. M., 1 meteor, from under Arcturus to west; July 1, 1:05 A. M., 1 meteor, course N. to S. E. of meridian; 1:15 A. M., 1 meteor, course zenith to south; Aug. 30, 1:40 A. M., 1 meteor, E. to W., south of zenith; Sept. 23, 7 P. M. to 7:20 P. M., 4 meteors, zenith to south.—*Kalamazoo.*

July 20, 8 P. M., small, red, course N., swift; July 26, small, red, course S. E., slow; Sept. 7, 1 meteor, size small, course short, N. W.—*Thornville.*

Nov. 16, 8:12 P. M., 1 meteor passed from near zenith due north, left bright trail of blue and red like large rocket.—*Gulliver Lake.*

Aug. 4, 9:30 to 10:30 P. M., numerous meteors shooting from slightly south of zenith to S. W. and N. W. Sept. 9, 10:30 P. M., bright meteor falling from S. to E.—*Lansing.*

MEASUREMENTS AND TEMPERATURE OF GROUND WATER.

In a paper entitled "Typhoid Fever and Low Water in Wells," on pages 89–114 of the Report of this board for 1884, it is shown that for the years 1878–82 there was a relation between the sickness and deaths from typhoid fever in Michigan and the depth of water in wells. In the month of October, when the water in wells reached the lowest point in the year, there were the most deaths and sickness from typhoid fever; and following the

month of April, when the water in wells was highest, there were the least deaths and sickness from typhoid fever. When this comparison is made in a diagram, it is found that, "beginning with June in each year the curve representing sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground water."

Typhoid fever being one of the most important causes of death in Michigan, it is of very great importance that further evidence be collected on this important subject.

The measurements for each month in 1889, of the depth of wells at six places in Michigan, are shown in Exhibit 8; also the depth of earth above water in wells and temperature of water in wells. It is hoped these measurements and observations may continue, and permit a more extended comparison of the depth of water in wells with the sickness from typhoid fever, and with sickness and death from other diseases.

CHANGE OF EXPOSURE OF INSTRUMENTS AT LANSING IN 1884.

Comments on the subject of a new instrument shelter at Lansing are printed on page 21, Report for 1885. Exhibits A, B, C, and D, pages 22 and 23, of the report for 1886, relate to that subject, and may be studied in connection with what is said on page 21, Report for 1885. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years.

EXHIBIT No. 8.—*Depth of Wells; Depth of Ground above Water in Well; Temperature of Water in Well, and day of observation of such temperature, in each month of the year 1889, as reported by Meteorological Observers for the State Board of Health, and for the United States Signal Service.*

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well, Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Traverse City*	55	37 10	47^{22}	55	36 11	47^{22}	55	39 10	47^{23}	55	38 2	47^{22}	55	39 1	47^{22}	55	39	46^{24}
Alpena	8	7	33^{18}	8	6 8	32^{17}	8	7 3	32^{17}									
Lansing, S. B. of H.	26 11½	24 10	50^{16}	26 11½	25 4¼	49^{15}	26 11½	25 4½	49^{16}	26 11½	25 2	48^{15}	26 11½	25 3⅞	49^{16}	26 11½	24 11¾	49^{15}
Ann Arbor	15	14 4½	44^{16}	15	14 ½	40^{16}	15	13 11¾	45^{16}	15	12 1⅜	43^{16}	15	13 11¾	46^{17}	15	10 5½	48^{17}
Battle Creek	52 6		53^{20}	53 10	51 10	54^{20}	53 10	51 10	54^{27}	53 10	51 11	52^{22}	53 10	52 7	52^{19}	53 10	51 7	51^{17}
Kalamazoo (Asylum)	25	15	48^{31}	25	15	48^{15}	25	15	48^{15}	25	15	47^{15}	25	15	48^{15}	25	15	50^{15}
Otsego	14 6	12 10		14 6	12 6		14 6	12 6	^{15}	14 6	12 1	^{15}	14 6	12	^{15}	14 6	11	^{15}
River Raisin†	23	17 6	44^{15}	23	17 6	44^{15}	23	17	44^{15}	23	16 6	45^{16}	23	16 6	50^{10}	23	16	48^{15}
Hillsdale	30 6	27 1	49^{15}	30 6	26 6	48^{15}	30 6	24 6	49^{15}	30 6	23 6	48^{15}	30 6	24	49^{15}	30 6	23 9	49^{15}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.
* At Northern Michigan Asylum, W. H. Bauld, observer.
† D. W. Palmer, observer.

EXHIBIT 8.—CONTINUED.

Stations in Michigan.	July.			August.			September.			October.			November.			December.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Traverse City*	55	39	46^{23}	55	38 6	46^{26}	55	40	46^{23}	55	39	46^{24}	55	40	46^{25}	55	39	48^{27}
Lansing, S. B. of H.	26 11½	24 10½	50^{16}	26 11½	25 1½	50^{16}	26 11½	25 5⅛	50^{14}	26 11½	25 8⅛	51^{16}	26 11½	25 11	51^{15}	26 11½	26 ¼	51^{16}
Ann Arbor	15	11 9½	52^{15}	15	12 8½	53^{16}	15	12 11	54^{16}	15	13 1½	52^{16}	15	13 6	51^{15}	15	13 10	48^{15}
Battle Creek	53 10	51 7	52^{15}	53 10	51 4	62^{17}	.....	.....	.....	60 8½	58 8	53^{20}	.....	.....	.....	60 8	59 7	48^{18}
Kalamazoo (Asylum)	25	15	51^{15}	25	15	52^{15}	25	15	50^{10}	25	15	51^{15}	25	15	50^{15}	25	15	48^{15}
Otsego	14 6	11 4	.....	14 6	11 10	..... ^{15}	14 6	12 5	..... ^{15}	14 6	12 6	..... ^{15}	14 6	12 4	.....	.....	.....	.....
River Raisin†	23	16	46^{16}	23	16	48^{15}	23	17	48^{16}	23	17	50^{15}	23	17	48^{15}	23	17 6	48^{16}
Hillsdale	30 6	24 3	49^{15}	30 6	25 1	50^{15}	30 6	26 1	50^{15}	30 6	26 10	50^{15}	30 6	27 5	49^{15}	30 6	27 2	49^{15}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.
* At Northern Michigan Asylum, W. H. Bauld, observer.
D. W. Palmer, observer.

TEMPERATURE.

Compared with the average for the preceding 25 years at the Agricultural College, the mean temperature for January and December was high. A comparison, by months, of temperature in 1889, with the averages for corresponding months in the preceding 25 years, 1864–88, at the Agricultural College, near Lansing, is given in Exhibit 10, page 34.

The average temperature, by months, for the ten years, 1879–88, at Lansing, and a comparison of 1889, by months, with that average, are stated in Exhibit 11, page 34.

The average annual and monthly temperature at from 12 to 22 stations for a period of 12 years, 1877–88, is stated in Exhibit 9, page 29, in which is also given, by months, a comparison of 1889 with the average for 1888, and with the averages for the 12 years, 1877–88. By Exhibit 9, page 29, which gives averages for groups of several stations in Michigan, it appears that in 1889 the mean temperature in February, June and October was lower than in those months in 1888. It also appears that October was much colder than the average temperature of the corresponding month for the 12 years 1877–88, and January, March and December were warmer than the average temperature of the corresponding months for those years.

By Exhibit 15, page 39, it appears that, at the Agricultural College, the lowest temperature reached in February, 1889, was considerably below the average lowest temperature for the corresponding month in the preceding 16 years, and that in the month of January, 1889, the range of temperature was considerably less than the average range of temperature for the corresponding month in the 16 preceding years, and also the highest temperature for 1889 was below the average highest temperature for the preceding 16 years, and the lowest temperature was the same as the average lowest temperature for those years. The highest and lowest temperatures at the Agricultural College, in every month of the 14 years, 1876–89, and comparisons of months in 1889, with the average highest and lowest temperatures by months for the preceding 16 years, are stated in Exhibit 15.

The average temperatures at each of 22 stations in Michigan, and the average for 13 stations and for 5 stations in 1889, and in each month of that year, are stated in Table I, page 31; 9 of the lines in this table are represented in Diagram I., page 30.

The average daily range of temperature at from 6 to 18 stations per year, by months, for a period of ten years, 1879–88, and a comparison of 1889, with the monthly averages for that period and for 1889, are given in Exhibit 12, page 35. The highest and lowest temperatures in every month in 1889, at each of 17 stations, are stated in Table II., pages 32 and 33. The average daily range of temperature by months in 1889, at each of 16 stations, and the average for the 16 stations, are stated in Table III., page 37. The lines for 10 of these stations, and the average line for the 16 stations, are represented in Diagram II., page 36. It will be noticed that the greatest average daily range occurred during the months of July, August and September.

EXHIBIT 9—***Average Temperature by Year and Months, in 1889,* compared with Annual and Monthly Averages for 1888, and for the Twelve Years, 1877–1888. These Averages are for Groups of Several Stations in Michigan.***

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877–88..	45.91	19.84	23.28	29.12	44.01	56.24	65.46	70.78	67.99	61.07	49.90	36.19	27.02
Av. 10 years, 1879–88.	45.30	19.18	21.74	28.20	42.92	56.19	65.29	70.24	67.44	60.51	49.59	35.84	26.48
1888 (13 stations).....	45.03	15.93	21.65	25.89	42.81	53.40	68.03	70.95	68.05	58.20	46.01	38.73	30.73
1889 (13 stations).....	47.36	28.18	18.57	35.83	46.04	56.74	62.05	70.69	68.58	61.36	44.59	37.95	36.76
In 1889 **Higher** than Av. for 12 years, 1877–88.....	1.45	8.34	.....	6.71	2.03	.50	.....	.....	.59	.29	.....	1.76	9.74
In 1889 **Lower** than Av. for 12 years, 1877–88.....	.....	.....	4.71	.....	.....	.....	2.41	.09	.....	.....	5.31	.....	.....

NOTE.—The stations represented in the lines for average temperature for the years 1877–88, in Exhibit 5, are the following: Thornville, Kalamazoo for 1877–88; Mendon for 1877–82; Tecumseh for 1877–85 and 1888; Battle Creek for 1877–80, 1882, 1885, 1888; Coldwater, Ypsilanti, Woodmere Cemetery (near Detroit) for 1877–9; Otisville for 1878–80, 1882; Niles for 1878–9, 1881; Marquette for 1879–84, and 1886–7; Alpena, Grand Haven, Port Huron for 1879–87; Lansing for 1879–88; Washington for 1879–83; Benton Harbor for 1877–8; Agricultural College for 1877 and 1881–8; Petoskey for 1878–9; Escanaba for 1880–7; Harrisville for 1881–2 and 1885–6; Ann Arbor for 1881–8; Parkville for 1881–2; Traverse City, Marshall for 1882–8; Hillsdale for 1882–4; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Ionia for 1883–5; Manistique, Swartz Creek for 1884–5; Mackinaw City for 1884–7; Port Austin for 1885 and 1888; Muskegon, Pentwater for 1886; Birmingham, Otsego, Gulliver Lake for 1887–8; Detroit for 1877–87; Nirvana for 1877–9 and first four months of 1880; Reed City for last eight months of 1880 and 1881–5.

* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 9, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

DIAGRAM I.—AVERAGE TEMPERATURE, BY MONTHS, 1889.

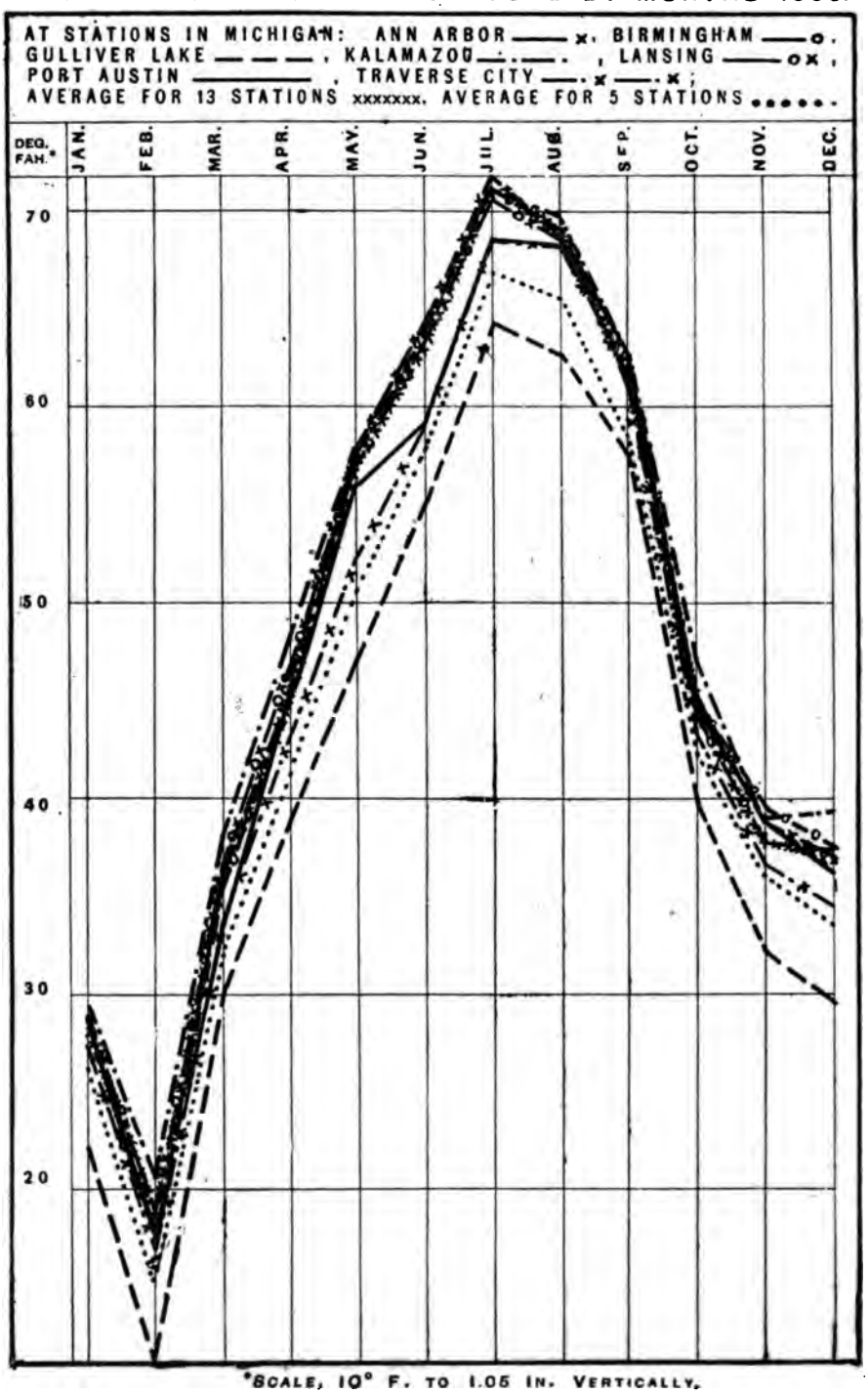


TABLE I.—*Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1889, at each of 18 Stations in Michigan, and also Average lines for 13 Stations and for 5 Stations. From Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Temperature in Degrees Fahr.													
		Year.		Months,** 1889.											
		Norm.¶	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 13 stations§	.....	.....	47.36	28.18	18.57	35.83	46.04	56.74	63.05	70.69	68.58	61.36	44.59	37.95	36.76
Av. for 5 Stations	.....	.....	43.87	26.06	15.40	32.34	41.42	50.65	57.92	66.76	65.61	58.45	42.19	36.08	33.58
Marquette	U. P.	38.95[4]	40.12	22.52	10.70	29.61	38.00	42.26	55.50	63.76	63.22	55.99	39.36	32.32	28.22
Gulliver Lake	U. P.	39.85[3]	40.94	22.13	11.18	30.41	38.94	47.20	55.30	64.30	62.63	57.68	39.74	32.19	29.52
Manistee	N. W.	.....	44.46	27.00	13.00	33.30	42.80	51.70	56.60	66.27	65.50	59.35	41.25	36.40	35.30
Traverse City	N. W.	42.91[7]	45.45	27.27	16.89	33.81	43.41	52.33	59.02	68.54	68.16	61.43	43.29	36.68	34.54
Alpena	N. E.	41.09[17]	41.89	24.30	12.80	30.40	39.40	49.40	56.00	65.09	63.13	56.68	39.96	34.20	31.30
Harrisville	N. E.	.....	43.55	26.16	14.71	32.88	42.12	51.10	57.64	66.22	64.68	57.57	40.91[g]	36.52	32.08
Grand Haven	W.	.....[2]	‡‡	28.80	19.30[f]	34.30	43.10[g]	52.90[d]	58.60	67.50[e]	66.50[e]	.....	44.30[f]	38.60[b]	37.40[b]
Port Austin	B. & E.	45.20[15]	46.67	28.81	17.35	33.37	45.62	56.15	59.27	68.38	68.08	62.82[h]	45.11	38.87	36.18
Port Huron	B. & E.	44.89[13]	45.24	27.70	16.60	32.90	42.30	53.50	59.00	68.20	66.40	59.70	43.50	37.50	35.60
Thornville	B. & E.	47.69	48.61	28.89	18.21	36.78	46.83	58.48	65.31[b]	72.46	70.66	63.23	45.46	39.19	37.80
Alma	C.	.....[26]	¶¶	.....	.....	35.96	46.49	57.95	62.95	73.41	70.89	60.11	44.06	37.99	36.27
Agricultural College	C.	46.44[11]	47.33	28.04	18.25	36.51	46.59	57.37	62.83	70.19	68.56	61.24	44.19	37.39[b]	36.75
Lansing, S. B. of H.††	C.	47.16[3]	47.65	29.00	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.39	37.71	37.31
Otsego	S. W.	46.86	47.21	28.40	19.63	35.23	45.61	58.62[i]	64.66	70.54	67.23	59.94	42.47	37.39	36.78
Albion	S. C.	.....[9]	§§	.....	.....	.....	.....	54.85	64.68	72.38	69.10	61.40	44.90	37.93	38.25
Ann Arbor	S. C.	46.24	47.83	28.70	18.79	36.23	45.99	57.60	64.30	71.70	68.70	61.00	45.30	38.70	37.00
Battle Creek	S. C.	.....[13]	51.13	30.38	23.35	38.65	49.77	62.15	68.51	75.57	73.38	64.05	47.44	41.10	39.25
Kalamazoo	S. C.	47.64[7]	48.96	29.41	20.58	38.11	48.09	57.89	64.55	71.22	69.87	62.72	47.01	38.71	39.37
Marshall	S. C.	48.24[2]	48.83	30.28	22.11	38.41	48.51	58.59	65.30	72.47	69.06	62.04[g]	44.23	37.34	37.67
Tecumseh	S. C.	46.18[3]	47.54	27.69[a]	18.31	36.08[b]	46.76[c]	56.70[a]	63.50[b]	71.80[b]	67.62[b]	59.22[b]	45.98[a]	38.60	38.19
Birmingham	S. E.	46.41[18]	47.58	27.38	17.92	35.43	45.49	57.56	63.76	71.22	69.12	60.95	45.06	39.51	37.51
Detroit	S. E.	48.14	47.66	28.80	18.90	35.50	44.60	56.40	62.50	70.48	69.80	60.52	46.90	40.00	37.50

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 23 days. h For 22 days. i For 18 days.

* At the U. S. Signal Service Stations during the year 1889, the observations were made at 8 A. M. and 8 P. M., 75th meridian time, and one-half the sum of the two observations was taken as the daily average. The local time at these stations corresponding to 8 A. M. and 8 P. M., 75th meridian time, is as follows: At Port Huron, 7:30 A. M. and 7:30 P. M.; at Detroit, 7:28 A. M. and 7:28 P. M.; at Alpena, 7:26 A. M. and 7:26 P. M.; at Grand Haven, 7:15 A. M. and 7:15 P. M.; at Marquette, 7:11 A. M. and 7:11 P. M.; at Manistee, 7:15 A. M. and 7:15 P. M. At the other stations the observations were made at 7 A. M., 2 P. M. and 9 P. M., local time, and the daily averages were one-third the sum of these three observations.

[The remaining foot-notes are on page 33.]

The lines for 7 representative stations in Table I. are graphically represented in Diagram 1., page 30.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and Range for the Year 1889, at each of 17 Stations in Michigan.—As indicated by Daily 2 P. M. and 9 P. M., by Observers* for the State Board of Health, and for the U. S.*

Line Number.	Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Year, 1889.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 17 Stations †	97	-23	120	53	-7	49	-23	65	5	80	14	95	23
2	*Marquette* ....§	88	-21	109	45 2, 3	3 18	48 28	-21 23	62 23	8 13	68 10	18 5	82 7	30 25, 29
3	Gulliver Lake‡	85	-20	105	41 16	-7 14	36 16, 28	-20 22,23,24	53 22	5 29	63 18	14 4	73 9	28 28
4	*Manistee* .....§	87	-9	96	50 16	5 19	37 16, 21	-9 28	65 16	14 30	73 18	22 6	84 7	33 2,29,31
5	Traverse City..‡	95	-22	117	46 16, 25	1 14	40 16, 21	-22 23	63 16	12 1	75 18	21 13	91 8	27 2, 28
6	*Alpena*.....§	91	-14	105	46 17	4 29	36 17, 21	-14 24	56 23	12 29	68 24	21 5	91 18	26 28
7	Harrisville....‡	95	-23	118	45 16, 25	-5 31	39 28	-23 22	56 23	9 29	71 19, 24	19 13	87 9	25 28
8	*Grand Haven*§	...	...	...	53 16	11 19	41 4, 16	-10 24	69 15	17 30	73 18	22 6	81 7, 8, 17	32 1
9	Port Austin...‡	95	-8	103	48 16, 17	11 14, 15	41 28	-8 22, 23	56 15,16,17,23	13 29, 30	74 20, 23	25 5	95 19	32 28
10	*Port Huron*...§	91	-13	104	52 16	5 29	41 16	-13 24	63 24	14 30	74 19	24 6	88 18	30 1
11	Thornville....‡	97	-23	120	49 3, 16	-6 29	44 16	-23 24	64 24	21 11, 29	76 19	22 6	90 18	34 28
12	Alma.....‡	...	...	...	...	...	...	...	68 16	6 1	76 18	20 6	90 18	27 28
13	Agr'l College..‡	93	-15	108	50 16	2 28	42 27, 28	-15 23	65 15, 16	8 29	75 19	20 5	88 18	29 2
14	Lansing, S. B. of H.....‡	91	-15	106	50 16	4 31	42 16	-15 23	64 15	11 29	74 18	19 5	88 18	31 27
15	Otsego.....‡	...	...	...	44 16	10 19	40 16,27,28	-17 23	65 16	16 30	78 20	20 6	88 17, 18	33 2, 30
16	Albion.....‡	...	...	...	...	...	...	...	...	...	...	...	85 18	35 30
17	Ann Arbor...¶	93	-10	103	51 16	22, 29 6	46 17	-10 6	61 7, 24	14 30	73 18	20 6	87 18	33 3
18	Battle Creek..‡	92	-8	100	25,26,27,28 21	7 22	44	23, 24 -8	64 24, 25	30 12	18, 19 80	6 19	89 10	1, 3 31
19	Hudson.....‡	...	...	...	52 16	-5 21	48 16	12, 23 -10	67 15, 17	29 7	17 89	5 15	7,8,10,17,18 90	22 29
20	Kalamazoo....‡	90	-11	101	53 16	5 22	46 27	-11 24	65 15	18 30	74 18	20 6	88 17, 18	31 1
21	Marshall.....‡	94	-8	102	50 16	9 21	43 16	-8 22	64 15	13 30	76 18	20 6	91 18	30 1
22	Tecumseh...‡**	...	...	...	52 16	0 22	43 21	-12 23	67 15	10 30	81 18	20 6	92 10	29 1
23	Birmingham..‡	94	-18	112	50 16	-6 29	45 16	-18 23	63 24	13 30	78 19	21 6	91 9	31 22
24	*Detroit*.....§	91	-8	99	49	7	49	-8	65	17	76	22	88 10	34 1, 2

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or the lowest temperature occurred.

* The names of observers, etc., are stated in Exhibit 1, page 10.

† The line No. 1, and the three columns for the year 1889, relate only to the 17 stations from which observations were received for every month of the year. It does not include Grand Haven, Alma, Otsego, Albion, Hudson and Tecumseh.

‡ For stations marked thus‡, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Signal Service the maximum thermometer was read and recorded at the morning observation, and the minimum at the evening observation.

¶ At Ann Arbor the registering thermometers were read and recorded at 9 P. M.

‖ Observations for January to August inclusive with dry bulb of psychrometer.

** Observations for January to June inclusive with dry bulb of psychrometer.

†† Beginning with the year 1885 allowance must be made for Lansing in Table II, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B, on page 22, Report for 1886.

the Lowest Temperature occurred by Months of the year 1889; also, Extremes and Readings of Registering Thermometers, or by Observations made daily at 7 A. M., Signal Service.

June.		July.		August.		September.		October.		November.		December.		Line Number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
93	36	97	36	94	37	93	25	76	14	66	11	65	2	1
30	3, 4	1, 2, 6	20	28	5, 24	2	27	10	23	19	14	24	30	
87	38	88	45	88	45	84	34	67	24	66	30	46	6	2
30	5	1,9,18	19	31	4	1	21	9	22	9	29	23	30	
84	36	85	42	82	38	80	29	58	18	50	11	41	2	3
30	1, 2	8	25	31	6	1	22	3	23	2	30	24	4	
83	37	86	50	86	44	87	33	59	22	51	16	57	15	4
14	1	8	23	29	5	3	21, 27	19	22	2, 6	29	29	30	
89	38	95	43	94	40	90	33	64	16	55	15	54	6	5
19	6	8	21, 24	29	11	2	22	9, 15	23	2	30	29	4	
84	40	91	46	89	42	84	32	57	20	58	14	52	10	6
19	1, 9, 23	10	20	20	30	2	26	3, 19	22	2, 3	29	29	30	
84	40	95	36	88	37	84	25	62	14	58	11	56	10	7
29, 30	1, 2	1	5	31	7			11, 12	23, 29	2	29	8, 29	4	
85	40	86	50	91	46			64	24	55	18	55	16	8
14	1, 2, 4	10	20	30	5	15	26	20	23	2	30	29	1	
85	43	94	48	89	50	91	41	67	28	58	18	59	18	9
19	1, 6	9	21	19	6	2	22	3	8, 21	2	30	29	4	
84	42	91	45	89	46	87	32	68	26	60	13	62	12	10
19, 20, 30	3	8	21	19	11, 17	2	22	11	21	2	29	24	4	
86	44	97	50	90	49	92	35	69	20	60	11	61	19	11
30	10,23,24	10	24	31	11	1	22	11	24	2	28	24	31	
90	40	95	47	89	42	88	27	71	18	58	9	59	10	12
29	3	2, 9	25	30	10	1	21	11	23	2	30	29	1	
85	39	89	47	93	42	92	25	73	17	58	11	62	14	13
14, 19	3	9	23, 24	30	11	1	21	11	22	1, 2	28	29	3, 30, 31	
84	40	90	48	91	45	89	28	73	19	57	13	62	17	14
14, 30	3	9	16, 21	30, 31	16	1	18, 20	11	6, 7, 20	1, 12, 13	30	24	30	
86	42	93	54	90	44	88	23	70	20	55	12	62	16	15
30	4	9	24	26, 27	11	1	21	11	22	1	30	24, 29	30	
84	48	90	53	86	50	86	32	73	26	57	14	60	20	16
28	1	9	17, 25	30	12	2	22	11	23	2	29	29	1	
93	40	91	52	88	49	85	34	75	25	58	14	62	16	17
19-20-27-28-29-30	2, 3, 4	9	4	30, 31	12	1	22	11	21	1	29	24	30	
85	47	92	51	89	53	87	38	74	29	56	23	61	20	18
19	2, 3	9	24	30	11	1, 15	21	11	23	2	29	29	30	
86	37	92	45	89	39	85	25	76	16	58	9	63	10	19
19	1	9	24, 31	30	5	3	22	11	29	1, 2	28	24	1	
85	36	90	53	90	49	87	34	74	26	57	15	63	14	20
30	4	1, 9	25	30	11, 12	1	22	11	21,23,24	2	30	24, 29	4	
89	41	94	49	93	45	93	28	76	23	58	12	62	13	21
16, 19, 30	1, 3	11	25	19	12	10, 15	22	11	24	2	30	29	1	
85	39	94	49	89	44	89	30	80	20	60	11	65	12	22
19, 30	2, 5	9	24	30	5, 14, 17	2	21	11	7	11	30	29	30	
86	39	94	46	92	43	91	31	72	20	61	13	63	16	23
19	1	8, 9	24, 25	19	11	2	22	11	8	2	29	29	4	
86	42	91	56	90	52	85	36	76	25	64	16	65	19	24

[Foot-notes from page 31.]

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1. page 10.

§ This line is an average for only the thirteen stations at which observations were made tri-daily, and from which statements nearly complete were received for every month of the year. It does not include the U. S. Signal Service Stations, Alma, Albion and Harrisville.

‖ This line is an average for the 5 U. S. Signal Service Stations, not including Grand Haven.

¶ Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1889. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

** The computations of Av. Temp., as tabulated for months in 1889, were made at the following stations: Marquette, Manistee, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron, Albion. All other computations in Table I. were made at the office of the State Board of Health.

†† Beginning with the year 1885, allowance must be made for Lansing in Table I., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

‡ The names of divisions, and the counties in each, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

‡‡ The average for 11 months is 44.66.

¶¶ For 10 months, 52.61.

§§ For 8 months, 55.44.

EXHIBIT 10.—*Comparison of the Average Temperature during the Year and during each month of the Year 1889, with the Annual and with the Monthly Averages for the Year 1888, and with the Averages for the 25 Years, 1864–88. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Temperature—Degrees Fahr.											
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
Av. 25 years, 1864-88.	46.40	21.27	23.70	30.80	45.64	58.16	67.69	71.59	68.72	60.24	48.22	35.44	25.60
1888	45.03	15.40	21.95	27.03	44.03	53.65	67.89	70.53	67.55	57.76	45.70	38.50	30.39
1889	47.33	28.04	18.25	36.51	46.59	57.37	62.83	70.19	68 56	61.24	44.19	37.39	36.75
In 1889 **Higher** than Av. for 25 years, 1864-88	.93	6.77	.....	5.71	.95	.....	.....	.....	.....	1.00	.....	1.95	11.15
In 1889 **Lower** than Av. for 25 years, 1864-88	.....	.....	5.45	.....	.....	.79	4.86	1.40	.16	.....	4.03	.....	.....
In 1889 **Higher** than in 1888	2.30	12.64	.....	9.48	2.56	3.72	.....	.....	1.01	3.48	.....	.....	6.36
In 1889 **Lower** than in 1888	.....	.....	3.70	.....	.....	.....	5.06	.34	.....	.....	1.51	1.11	.....

EXHIBIT 11.—*Average Temperature,* by Year and Months, for the 10 Years, 1879–88. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	* Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 10 years, 1879-88	47.11	20.35	23.79	30.65	45.85	58.95	67.74	72.68	69.00	61.58	50.79	36.94	27.06
1888	45.49	15.63	22.38	27.49	44.30	53.91	68.80	71.09	67.77	57.79	46.32	39.16	31.19
1889	47.65	29.00	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.39	37.71	37.31
In 1889 **Higher** than Av. for 10 years, 1879-88	.54	8.65	.....	6.16	1.06	.....	.....	.....	.....	.....	.....	.77	10.25
In 1889 **Lower** than Av. for 10 years, 1879-88	.....	.....	4.90	.....	.....	1.96	4.38	2.09	.54	.26	6.40	.....	.....
In 1889 **Higher** than in 1888	2.16	13.37	.....	9.32	2.61	3.08	.....	.....	.69	3.53	.....	.....	6.12
In 1889 **Lower** than in 1888	.....	.....	3.49	.....	.....	.....	5.44	.50	.....	.....	1.93	1.45	.....

* Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 11, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

EXHIBIT 12.—*Average Daily Range of Temperature, by Year and Months in 1889, compared with Annual and Monthly Averages for 1888, and for the 10 years, 1879-88. These Averages are for Groups of Several Stations in Michigan.**

Years, etc.	Average Daily Range of Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1879-88*	18.22	16.40	18.06	17.99	19.35	20.72	20.68	20.66	19.98	19.80	17.26	14.58	13.17
1888 (15 stations)...	17.42	15.28	17.70	17.73	18.70	18.04	21.11	20.68	20.21	20.33	14.58	13.47	11.28
1889 (16 stations)...	17.46	13.93	17.32	16.74	18.74	19.28	18.00	21.20	21.50	20.59	16.98	11.81	13.41
In 1889 Greater than average for 10 years, 1879-88	.....	.....	.....	.....	.....	.....	.....	.54	1.52	.79	.....	.....	.24
In 1889 Less than average for 10 y'rs, 1879-88	.76	2.47	.74	1.25	.61	1.44	2.68	.....	.....	.....	.28	2.77	.....
In 1889 Greater than in 1888	.04	.....	.....	.....	.04	1.24	.....	.52	1.29	.26	2.40	.....	2.13
In 1889 Less than in 1888	.....	1.35	.38	.99	.....	.....	3.11	.....	.....	.....	.....	1.66	.....

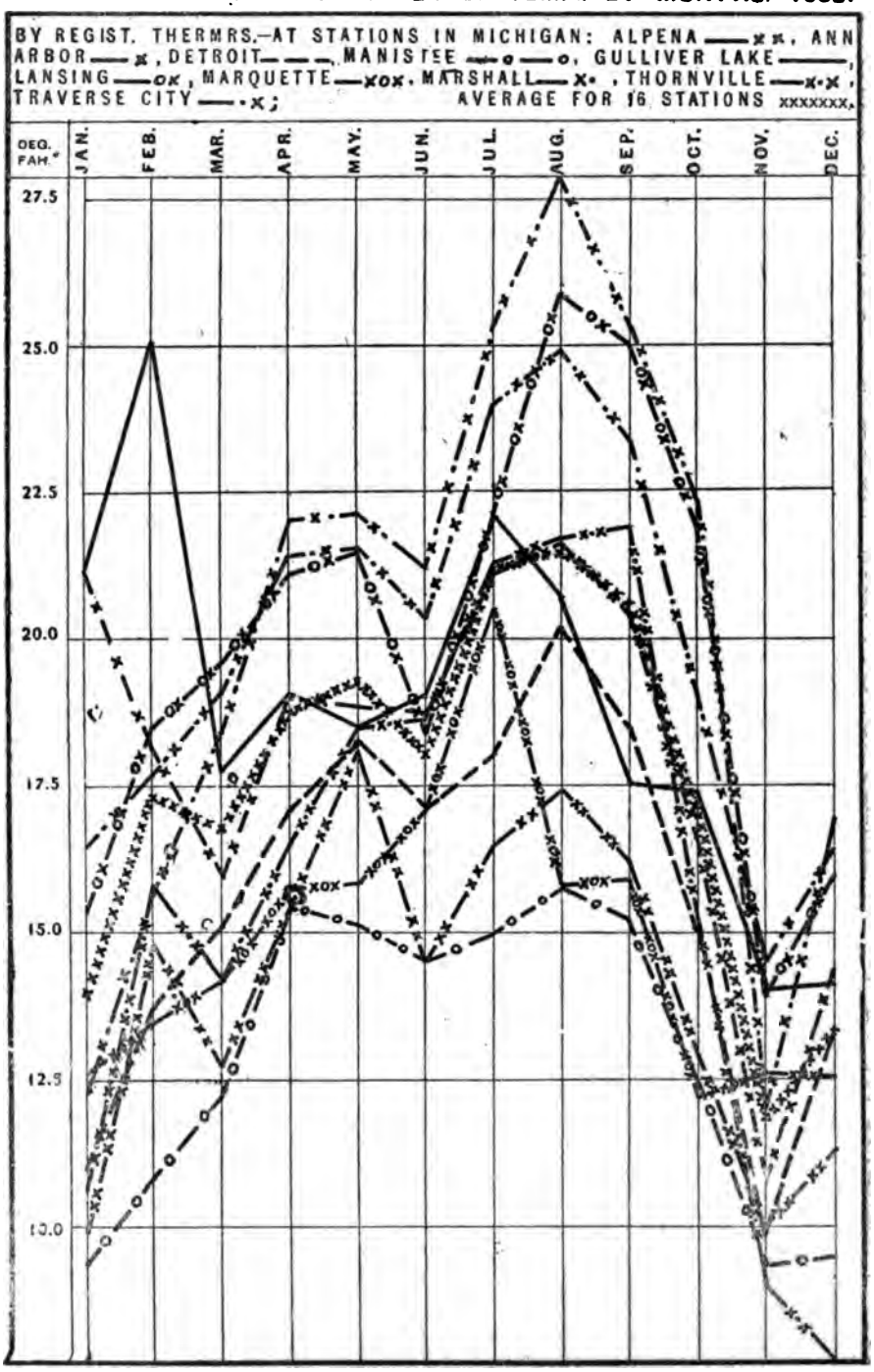
* Marquette for 1879-84 and 1886-8; Grand Haven, Lansing, Detroit for 1879-88; Otisville for 1879-80 and 1882; Battle Creek for 1879-80 and 1888; Escanaba for 1880-87; Alpena, Port Huron, Thornville for 1880-8; Kalamazoo for 1880-3 and 1886-8; Adrian for 1880; Agricultural College for 1881-8; Traverse City, Marshall for 1882-8; Harrisville for 1882 and 1885-8; Reed City for 1882 and 1884-5; Ann Arbor for 1882-3 and 1885-8; Washington for 1882-3; Winfield for 1883; Tecumseh for 1883-5; Manistique, Ionia, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Hillsdale for 1884; Pentwater, East Saginaw, Hudson for 1886; Birmingham for 1887; Gulliver Lake for 1887-8; Port Austin for 1888.

EXHIBIT 13.—*Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year 1889, with Averages for the 15 Years, 1874-88, and for the Year 1888. Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Daily Range of Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 15 years, 1874-88*	20.97	17.04	19.14	19.23	22.48	24.47	23.22	25.01	25.51	24.11	20.17	16.23	14.98
1888	19.76	17.71	19.72	18.61	21.57	19.54	21.07	24.35	24.64	26.34	15.84	15.87	11.87
1889	20.38	15.19	21.28	20.65	21.50	20.45	18.37	22.93	26.65	27.20	23.07	12.60	14.61
In 1889 Greater than Av. for 15 years, 1874-88	.....	.....	2.14	1.42	.....	.....	.....	.....	1.14	3.09	2.90	.....	.....
In 1889 Less than Av. for 15 years, 1874-88	.59	1.85	.....	.....	.98	4.02	4.85	2.08	.....	.....	.....	3.63	.37
In 1889 Greater than in 1888	.62	.....	1.56	2.04	.....	.91	.....	.....	2.01	.86	7.23	.....	2.74
In 1889 Less than in 1888	.....	2.52	.....	.....	.07	.....	2.70	1.42	.....	.....	.....	3.27	.....

* For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882-89, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

DIAGRAM II.—AV. DAILY RANGE OF TEMP., BY MONTHS, 1889.



SCALE, 5° F. RANGE TO 1.58 IN. VERTICALLY.

TABLE III.—*Average Daily Range of Temperature, by Registering Thermometers, during the Year and during each Month of the Year 1889, at each of 18 Stations in Michigan, and Average for 16 Stations.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Norm. ‡	Average Daily Range of Temperature.—Degrees Fahr.												
			Yr. 1889.	Months, 1889.											
				Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 16 Stations §	.....	.....	17.46	13.93	17.32	16.74	18.74	19.28	18.00	21.20	21.50	20.59	16.98	11.81	13.41
Marquette	U. P.	16.21[4]	14.87	12.60	13.50	14.20	15.70	15.80	17.10	20.50	15.80	15.90	12.20	12.60	12.50
Gulliver Lake	U. P.	20.28[3]	18.87	21.16	25.07	17.74	19.10	18.55	19.03	22.13	20.71	17.47	17.36	14.03	14.13
Manistee	N. W.	.....	12.88	9.40	10.80	12.20	15.40	15.10	14.50	15.00	15.70	15.20	12.40	9.40	9.50
Traverse City	N. W.	19.49[3]	19.91	16.45	17.64	19.13	21.40	21.55	20.37	24.00	24.87	23.43	19.10	14.50	16.45
Alpena	N. E.	16.02[10]	14.14	9.90	14.80	12.70	15.40	18.10	14.50	16.50	17.40	16.20	12.90	10.00	11.30
Harrisville	N. E.	21.54[5]	20.76	15.29	21.68	16.87	20.63	24.16	21.00	26.55	27.39	24.50	21.65	14.90	14.48
Grand Haven	W.	.....	‖	9.20	12.30	12.70	15.10	15.90	14.30	14.50	15.50	.....	18.30	9.50	11.30
Port Austin	B. & E.	15.49[2]	15.83	11.45[a]	16.50	13.97	17.23[e]	20.06[a]	15.50	21.19	17.11[b]	21.57[f]	12.29	12.23	10.80
Port Huron	B. & E.	15.97[10]	15.17	11.40	14.40	13.50	15.80	17.20	16.50	18.40	20.30	18.90	13.80	10.10	11.70
Thornville	B. & E.	16.54[10]	15.92	10.58	15.75	14.13	16.53	18.52	18.67	21.29[c]	21.63	21.90	15.23	9.08	7.74
Alma	C.	.....	¶	.....	.....	21.27	23.77	26.29	22.67	25.67	26.77	27.13	20.61	15.03	16.74
Agricultural College	C.	20.25[8]	20.38	15.19	21.28	20.65	21.50	20.45	18.37	22.98	26.65	27.20	23.07	12.60	14.61
Lansing, S. B. of H.	C.	19.48[11]	19.93	15.29	18.50	19.61	21.13	21.45[g]	18.40	22.13	25.90[b]	25.00	21.87	13.90	15.97
Albion	S. C.	.....	**	.....	.....	.....	.....	16.92	14.30	17.82	19.90	19.50	18.40	12.02	14.00
Ann Arbor	S. C.	18.13[8]	18.06	21.16	18.15	15.98	19.03	18.83	18.70	21.11	21.60	20.40	16.60	10.73	14.40
Battle Creek	S. C.	17.39[2]	17.39	14.00	20.32	23.16	19.77	17.68	17.03	23.29	18.87	16.54	16.35	9.70	12.00
Hudson	S. C.	.....	23.46	15.87	18.93	21.77	28.63	26.67	22.80	28.09	30.49	27.67	24.81	17.50	18.26
Kalamazoo	S. C.	17.33[4]	17.59	12.53	18.07	18.63	19.92	19.23	17.50	18.60	19.80	18.40	18.85	13.07	16.50
Marshall	S. C.	19.57[8]	20.12	12.29	15.57	18.39	22.00	22.16	21.20	25.39	27.84[e]	25.26[d]	22.35	12.00	16.94
Tecumseh	S. C.	.....	††	.....	.....	.....	.....	.....	.....	25.55[a]	25.54[a]	26.22	20.88	13.37	14.90
Birmingham	S. E.	22.99[3]	22.68	18.45	23.05	18.82	22.87	25.55	23.50	28.67	29.57	27.54	22.29	15.17	16.71
Detroit	S. E.	15.79[11]	15.59	11.00	13.70	15.10	17.10	18.20	17.10	18.00	20.20	18.50	15.00	9.90	13.30

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10.

† For counties in each division see Exhibit I, in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the annual average range of temperature for periods of years ending in each case with December 31, 1889. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§ This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include the lines for Harrisville, Grand Haven, Alma, Albion and Tecumseh.

‖ The average for 11 months is 14.42. ¶ For 10 months, 22.60. ** For 8 months, 16.61. †† For 6 months, 21.08.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 28 days. c For 24 days. d For 23 days. e For 22 days. f For 21 days. g For 17 days.

NOTE.—Graphic representations of statements in Table III., are given in Diagram II, page 36

EXHIBIT 14.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each month of the Year 1889, with the Average of the Extremes, and of the Range, for the Twelve Years, 1877–88; also, Statement of the Extremes and of the Range for each of the Twelve Years, 1877–88. Observations made with Registering Thermometers by Observers for the State Board of Health, and for the U. S. Signal Service. These Comparisons, etc., are for* **Groups of Several Stations in Michigan.**

Year and Months.	Extremes and Ranges of Temperature.—Degrees F. 1877.			1878.			1879.			1880.			1881.			1882.			1883.			1884.			1885.			1886.			1887.			1888.			Av. for 12 years, 1877–88.			1889.*			1889 Higher (+), or lower (-), than Av. 12 years, 1877–88.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	95	-21	116	100	-14	114	102	-22	124	100	-23	123	101	-27	128	93	-27	120	99	-28	127	105	-33	138	96	-36	132	101	-30	131	104	-28	132	99	-33	132	100	-27	126	97	-23	120	-3	+4	-6
Av. Month	79	15	65	79	16	63	82	10	73	80	11	69	77	13	64	77	12	65	79	6	72	81	7	74	75	7	69	79	4	75	79	10	69	76	9	67	79	10	69	77	14	63	-2	+4	-6
January	63	-14	77	55	-11	66	50	-20	70	65	-3	68	43	-26	69	56	-27	83	50	-28	78	52	-33	85	53	-36	89	55	-22	77	54	-28	82	45	-23	68	53	-23	76	53	-7	60	=	+16	-16
February	64	-5	69	60	-14	74	46	-22	68	67	-12	79	54	-27	81	59	1	58	57	-28	85	64	-31	95	50	-33	83	54	-30	84	55	-21	76	49	-33	82	57	-21	78	49	-23	72	-8	-2	-6
March	58	-21	79	79	8	71	72	-12	84	67	-16	83	53	-5	58	67	-4	71	69	-20	89	65	-27	92	55	-29	84	73	-25	98	60	-14	74	69	-20	89	66	-15	81	65	5	60	-1	+20	-21
April	82	10	72	85	24	61	87	5	82	78	5	73	84	-2	86	79	11	68	87	2	85	80	17	63	84	6	78	84	0	84	82	8	74	88	6	82	83	8	76	80	14	66	-3	+6	-10
May	95	21	74	85	25	60	95	22	73	90	27	63	94	20	74	83	11	72	84	22	62	84	27	57	87	18	69	88	22	66	97	28	69	84	21	63	89	22	67	95	23	72	+6	+1	+5
June	92	34	58	96	31	65	98	30	68	94	37	57	90	31	59	93	25	68	94	31	63	95	37	58	93	32	61	95	27	68	98	40	58	99	29	70	95	32	63	93	36	57	-2	+4	-6
July	95	43	52	100	46	54	100	41	59	100	43	57	99	45	54	93	39	54	99	40	59	93	37	56	96	39	57	101	33	68	104	39	65	97	40	57	98	40	58	97	36	61	-1	-4	+3
August	93	43	50	94	40	54	102	35	67	95	39	56	101	41	60	92	41	51	97	32	65	102	34	68	90	35	55	98	32	66	98	37	61	94	33	61	96	37	60	94	37	57	-2	=	-3
September	91	36	55	92	29	63	100	25	75	93	26	67	100	42	58	90	27	63	95	25	70	105	30	75	88	25	63	91	27	64	91	26	65	90	28	62	94	29	65	93	25	68	-1	-4	+3
October	87	25	62	85	13	72	94	20	74	90	24	66	78	21	57	86	21	65	84	21	63	96	20	76	81	13	68	83	16	67	80	11	69	73	23	50	85	19	66	76	14	62	-9	-5	-4
November	63	-1	64	68	15	53	81	0	81	67	-12	79	67	6	61	74	8	66	68	-8	76	75	-6	81	68	19	49	72	-15	87	70	-6	76	72	8	64	70	1	70	66	11	55	-4	+10	-15
December	70	5	65	49	-9	58	61	-9	70	55	-23	78	60	4	56	50	-15	65	59	-12	71	60	-27	87	55	-11	66	53	-22	75	56	-6	62	55	1	54	57	-10	67	65	2	63	+8	+12	-4

* For the thirteen years, 1877-89, the highest temperature was 105°. at Battle Creek, September 9, 1884; the lowest was -36°, at Manistique, January 27, 1885,

EXHIBIT 15.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each month of the Year 1889, with the Average of the Extremes, and of the Range, for the Sixteen Years, 1873–88; also Statement of the Extremes and of the Range for each of the Fourteen Years, 1876–89. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M. and 9 P. M.) Daily by Prof. R. C. Kedzie,* **at the State Agricultural College, near Lansing, Mich.** *For Nov. and Dec., 1879, the observations were made by Harry B. Turner, at the Office of the State Board of Health, Lansing.*

Extremes and Ranges of Temperature.—Degrees F.

Year and Months.	Av. 3 years, 1873-5.			1876.			1877.			1878.			1879.			1880.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	101	-30	131	96	-19	115	93	-14	107	98	-7	105	97	-18	115	94	-17	111
Av. Month	75	13	62	74	19	56	74	20	54	73	22	51	76	15	61	74	20	54
January	46	-17	62	65	6	59	52	-9	61	48	-4	52	44	-18	62	62	9	53
February	46	-16	62	59	-1	60	56	10	46	55	-7	62	41	-6	47	59	-2	61
March	66	5	71	60	0	60	51	-14	65	72	18	54	66	4	62	55	6	49
April	77	9	68	74	16	58	81	18	63	75	29	46	81	12	69	76	20	56
May	90	24	66	89	31	58	90	26	64	77	29	48	91	25	66	87	40	47
June	93	36	56	95	42	53	89	40	49	94	39	55	95	33	62	92	41	51
July	94	44	50	96	46	50	91	43	48	98	47	51	97	47	50	94	50	44
August	96	40	56	96	36	60	93	43	50	93	42	51	96	34	62	88	43	45
September	93	27	65	80	36	44	85	38	47	92	31	61	85	27	58	88	30	58
October	77	17	61	75	19	56	87	26	61	82	21	61	87	15	72	76	24	52
November	62	2	60	62	12	50	55	4	51	52	15	37	75	13	62	62	-4	66
December	61	1	60	41	-19	60	58	13	45	36	-2	38	58	-3	61	47	-17	64

Year and Months.	1881.			1882.			1883.			1884.			1885.			1886.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	100	-17	117	89	-10	99	91	-20	111	90	-25	115	90	-24	114	93	-18	111
Av. Month	73	22	52	72	23	49	71	14	57	71	14	58	68	15	53	74	17	57
January	37	-9	46	50	-2	52	41	-19	60	44	-22	66	42	-22	64	50	-12	62
February	48	-17	65	57	12	45	50	-20	70	52	-18	70	45	24	69	52	-18	70
March	50	9	41	66	16	50	52	-8	60	57	-13	70	44	-13	57	65	5	60
April	83	9	74	73	21	52	83	14	69	74	21	53	81	17	64	80	16	64
May	89	33	56	79	28	51	80	31	49	80	28	52	85	26	59	83	34	49
June	86	40	46	87	44	43	87	42	45	89	43	46	86	40	46	90	41	49
July	95	52	43	89	47	42	90	45	45	89	44	45	90	47	43	93	45	48
August	100	46	54	89	49	40	91	32	59	90	36	54	84	42	42	91	37	54
September	97	43	54	85	32	53	86	28	58	89	36	53	80	35	45	87	35	52
October	75	30	45	77	24	53	77	22	55	81	22	59	72	17	55	80	30	50
November	64	12	52	70	14	56	63	7	56	59	10	49	62	21	41	70	3	67
December	56	12	44	40	-10	50	55	-2	57	53	-25	78	48	-7	55	50	-13	63

Year and Months.	1887.			1888.			Av. for 16 years, 1873-88.			1889.*			1889 Higher (+), or lower (-), than Av. 16 years, 1873-88.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	98	-26	124	92	-19	114	94	-19	113	93	-15	108	-1	+4	-5
Av. Month	73	17	57	72	18	54	73	17	56	73	20	53	=	+3	-3
January	46	-26	72	36	-16	52	47	-12	59	50	2	48	+3	+14	-11
February	52	0	52	45	-19	64	51	-10	60	42	-15	57	-9	-5	-3
March	53	-1	54	69	2	67	60	0	60	65	8	57	+5	+8	-3
April	76	14	62	81	21	60	78	16	62	75	20	55	-3	+4	-7
May	88	38	50	80	25	55	85	29	56	88	29	59	+3	=	+3
June	91	43	48	92	39	53	91	40	51	85	39	46	-6	-1	-5
July	98	44	54	90	47	43	93	46	47	89	47	42	-4	+1	-5
August	98	37	61	90	36	54	93	40	53	93	42	51	=	+2	-2
September	88	26	62	88	32	56	88	32	56	92	25	67	+4	-7	+11
October	73	12	61	73	26	47	78	21	57	73	17	56	-5	-4	-1
November	65	13	52	72	13	59	64	9	55	58	11	47	-6	+2	-8
December	56	-3	59	52	9	43	52	-4	56	62	14	48	+10	+18	-8

* For the seventeen years, 1873–89, the highest temperature was 101°, August 11, 1874; the lowest was -33°, February 8, 1875, and the range was 134° F.

EXHIBIT 16.—*Average Absolute Humidity, by Year and Months, in 1889, compared with Annual and Monthly Averages for 1888, and for the 12 years 1877–88.* These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877–88†.	3.41	1.35	1.51	1.77	2.72	3.94	5.33	6.08	5.76	4.87	3.60	2.30	1.75
1888 (9 stations).....	3.31	1.25	1.51	1.67	2.55	3.69	5.71	5.95	5.59	4.30	3.05	2.49	1.92
1889 (9 stations).....	3.47	1.77	1.34	2.13	2.88	3.95	5.33	6.19	5.52	4.82	2.76	2.52	2.48
In 1889 **Greater** than Av. for 12 years, 1877–88.....	.06	.42	.....	.36	.16	.01	0	.11	.....	.....	.....	.22	.73
In 1889 **Less** than Av. for 12 years, 1877–88.	.....	.....	.17	.....	.....	.....	.....	.....	.24	.05	.84	.....	.....
In 1889 **Greater** than in 1888.....	.16	.52	.....	.46	.33	.26	.....	.24	.....	.52	.....	.03	.56
In 1889 **Less** than in 1888.....	.....	.....	.17	.....	.....	.....	.38	.....	.07	.....	.29	.....	.....

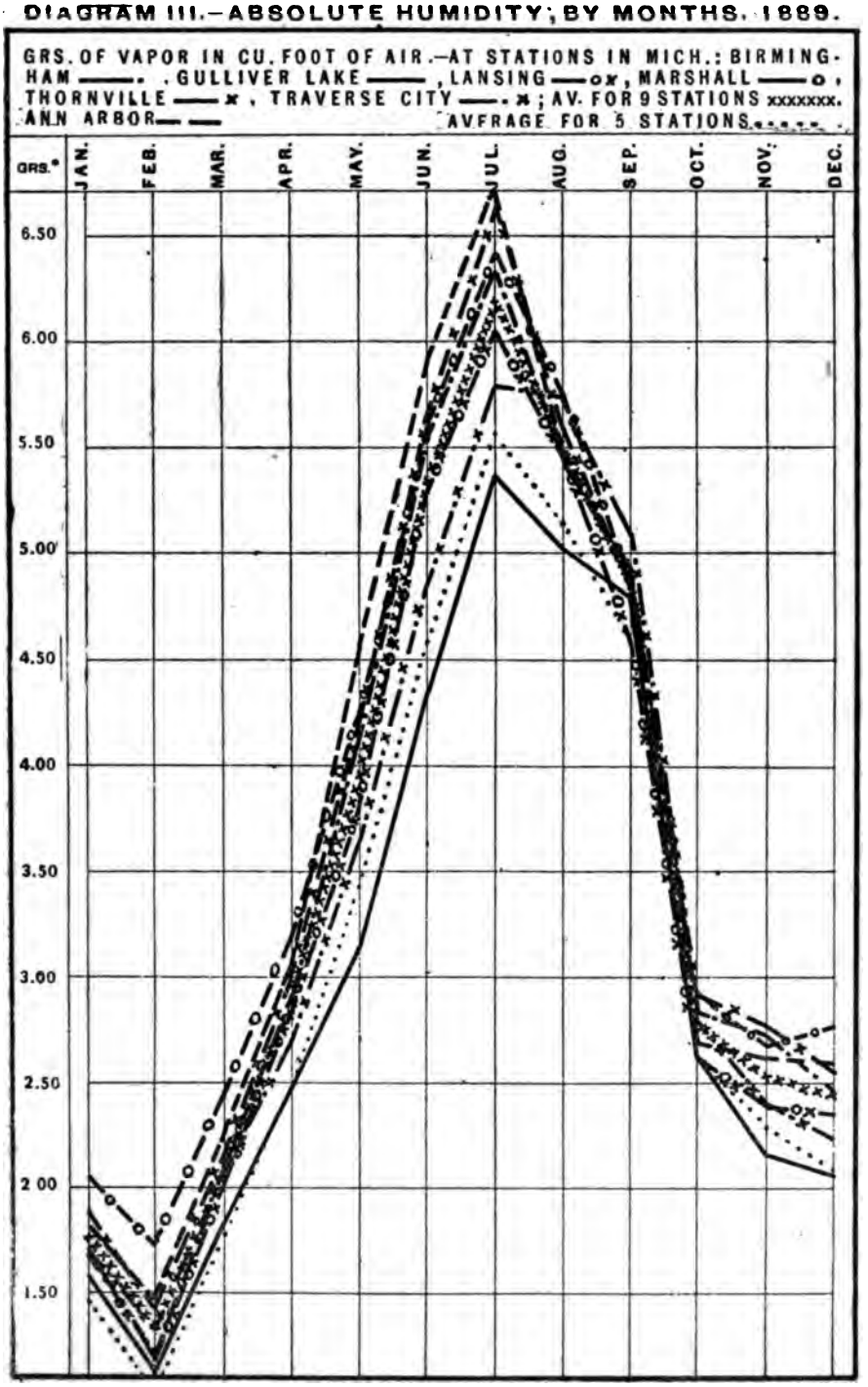
* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 16, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, on page 23, Report for 1886.

† Thornville for 1877-88; Detroit for 1877-87; Kalamazoo for 1877-83 and 1886-8; Mendon for 1877-82; Tecumseh for 1878-85; Battle Creek for 1877-9, 1882 and 1885; Otisville for 1878-80 and 1882; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-88; Agricultural College for 1877, 1881-8; Niles for 1878-9 and 1881; Nirvana for 1878-9 and first 4 months of 1880; Reed City for last eight months of 1880 and 1881-5; Escanaba for 1880-7; Woodmere Cemetery (near Detroit) for 1877-9; Traverse City, Marshall for 1882-8; Harrisville for 1882 and 1885-6; Parkville, Hastings for 1882; Hillsdale for 1882-4; Manistique and Swartz Creek for 1884-5; Mackinaw City for 1884-7; Ionia for 1884; Pentwater for 1886; Gulliver Lake and Birmingham for 1887-8; Benton Harbor, Coldwater for 1877-8; Washington for 1880-3; Petoskey for 1879; Winfield for 1881 and 1883; Ann Arbor for 1881-8.

EXHIBIT 17.—*Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1889, with averages for the 23 Years 1866–88, and for the Year 1888. Observations made at 7 A.M., 2 P.M. and 9 P.M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 23 years, 1866-88..	3.47	1.42	1.54	1.84	2.68	4.06	5.63	6.42	5.94	4.82	3.35	2.19	1.66
1888.....	3.26	1.18	1.52	1.65	2.48	3.63	5.68	5.89	5.51	4.07	3.07	2.56	1.88
1889.....	3.44	1.72	1.25	2.09	2.81	3.82	5.27	6.35	5.65	4.72	2.65	2.50	2.41
In 1889 **Greater** than Av. for 23 years, 1866–88.....	.....	.30	.....	.25	.13	.....	.....	.....	.....	.....	.....	.31	.75
In 1889 **Less** than Av. for 23 years, 1866 88.	.03	.....	.29	.....	.....	.24	.36	.07	.29	.10	.70	.....	.....
In 1889 **Greater** than in 1888.....	.18	.54	.....	.44	.33	.19	.....	.46	.14	.65	.....	.....	.53
In 1889 **Less** than in 1888.....	.....	.....	.27	.....	.....	.....	.41	.....	.....	.....	.42	.06	.....

DIAGRAM III.—ABSOLUTE HUMIDITY; BY MONTHS. 1889.



*SCALE, ONE GRAIN OF VAPOR (IN A CU. FT. OF AIR) TO 1.14 IN. VERTICALLY.

TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1889, at 16 Stations in Michigan; also Average Lines for 9 Stations and for 5 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Grains of Vapor in a Cubic Foot of Air—(Absolute Humidity.)													
		Year.		Months, 1889.											
		Norm. §	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations¶			3.47	1.77	1.34	2.13	2.88	3.95	5.33	6.19	5.52	4.82	2.76	2.52	2.43
Av. for 5 Stations**			3.08	1.47	1.04	1.78	2.48	3.43	4.58	5.55	5.14	4.56	2.60	2.28	2.09
Marquette	U. P.	2.74 (4, 3)	2.84	1.02	0.84	1.64	2.39	3.27	4.19	5.30	5.23	4.26	2.47	1.92	1.52
Gulliver Lake	U. P.	2.99	3.05	1.57	1.11	1.83	2.48	3.15	4.34	5.36	5.20	4.77	2.62	2.15	2.06
Manistee	N. W.		3.05	1.47	0.99	1.81	2.39	3.34	4.42	5.34	5.13	4.50	2.62	2.23	2.31
Traverse City	N. W.	3.35 (11, 5)	3.36	1.70	1.32	2.08	2.69	3.63	4.85	5.79	5.72	5.08	2.78	2.39	2.23
Alpena	N. E.	2.94 (2)	3.02	1.57	1.04	1.69	2.44	3.25	4.34	5.37	5.06	4.63	2.49	2.24	2.07
Harrisville	N. E.	2.65	2.72	1.10	0.58	1.37	2.28	3.10	4.04	5.15	4.80	4.25	2.34	1.94	1.63
Grand Haven	W.		††	1.81	1.27	1.96	2.54 m	3.48 g	4.77	5.50 e	5.21 h	k	2.69 f	2.43 d	2.36 j
Port Austin	B. & E.		‡‡				3.21	4.08	4.94	6.24	5.71	5.43	2.95	2.68	2.37
Port Huron	B. & E.	3.30 (11, 13)	3.20	1.57	1.09	1.79	2.51	3.58	4.79	5.85	5.19	4.69	2.71	2.42	2.21
Thornville	B. & E.	3.69	3.63	1.89	1.41	2.17 a	2.98	4.21	5.64 c	6.61	5.59	4.84	2.90	2.75	2.53
Alma	C.		§§			2.17	3.10	4.37	5.62	6.54	5.67	4.83	2.86	2.57	2.40
Agricultural College	C.	3.48 (10, 11)	3.44	1.72	1.25	2.09	2.81	3.82	5.27	6.35	5.65	4.72	2.65	2.50 e	2.41
Lansing, S. B. of H.	C.	3.38	3.35	1.68	1.18	2.03	2.83	3.79 l	5.28 c	6.04 a	5.43	4.56	2.61	2.38	2.34
Albion	S. C.		¶¶					3.89	5.64	6.43	5.55	4.76	2.61	2.39	2.34
Ann Arbor	S. C.	3.45 (9, 2)	3.66	1.82 a	1.46 l	2.26 a	3.05	4.55	5.90	6.69	5.50	4.83 c	2.68 a	2.60	2.58 b
Battle Creek	S. C.	4.35 (2)	4.41	2.19	1.45	2.90	3.97	5.28	6.50	8.40	6.96	5.89	3.61	3.01	2.76
Kalamazoo	S. C.	3.49 (4, 8)	3.52	1.81	1.42	2.19	2.98	4.09	5.54	6.14	5.45	4.81	2.83	2.53	2.49
Marshall	S. C.	3.71 (3)	3.72	2.04 a	1.71	2.45 b	3.19 d	4.22 a	5.62 c	6.42 b	5.75 b	4.87 c	2.94 a	2.66	2.76
Birmingham	S. E.	3.43 (13)	3.52	1.67	1.21	2.11	2.90	4.13	5.53	6.32	5.42	4.93	2.83	2.71	2.46
Detroit	S. E.	3.50	3.32	1.73	1.26	1.95	2.68	3.72	5.15	5.88	5.11	4.71	2.72	2.57	2.35

* At the U. S. Signal Service Stations for the year 1889, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The local time corresponding to these hours is stated in the star (*) foot-note to Table I., page 31.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit I, page 10.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

‖ The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

¶ This line is an average for only the stations at which observations were made tri-daily, and from which statements, nearly complete, were received for every month in the year. It does not include the lines for Harrisville, Battle Creek and the U. S. Signal Service Stations.

** This line is an average for 5 U. S. Signal Service Stations. Grand Haven is not included.

[The remaining foot-notes are on page 46.]

The lines for 7 stations in Table IV. are graphically represented in Diagram III., page 41.

EXHIBIT 18.—*Average Relative Humidity, by Year and Months, in 1889,* compared with Annual and Monthly Averages for 1888, and for the Eleven Years, 1878–88. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1877–88.†	76	82	81	77	70	68	72	72	74	75	76	79	83
1888 (9 stations)	77	90	87	84	69	71	70	71	72	74	76	79	83
1889 (9 stations)	77	85	88	77	71	69	80	75	70	74	73	84	84
In 1889 Greater than Av. for 11 years, 1878–88	1	3	7	0	1	1	8	3*	.....	.....	.....	5	1
In 1889 Less than Av. for 11 years, 1878–88	.....	.....	.....	.....	.....	.....	.....	.....	4	1	3	.....	.....
In 1889 Greater than in 1888	.....	.....	1	.....	2	.....	10	4	.....	.....	.....	5	1
In 1889 Less than in 1888	0	5	.....	7	.....	2	.....	.....	2	0	3	.....	.....

* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 18, because of a change in the location of instruments. The amount of the variation is shown in Exhibit D, on page 23, Report for 1886.

† Thornville for 1878–88; Detroit for 1878–87; Kalamazoo for 1875–83 and 1886–8; Mendon for 1878–82; Tecumseh for 1878–85; Otisville for 1878–80 and 1882; Nirvana and Woodmere Cemetery (near Detroit) for 1878–9; Nirvana and Reed City for 1880; Ann Arbor for 1881–8; Niles for 1878–9 and 1881; Marquette for 1879–84 and 1886–7; Alpena, Grand Haven, Port Huron for 1879–87; Lansing for 1879–88; Agricultural College for 1881–8; Escanaba for 1880–7; Washington for 1880–3; Coldwater for 1878; Petoskey for 1879; Mallory Lake and Hudson for 1881; Marshall, Traverse City for 1882–8; Hillsdale for 1882–4; Hastings for 1882; Harrisville for 1882 and 1885–6; Winfield for 1883; Reed City for 1881–5; Battle Creek for 1878–9, 1882, 1885; Manistique, Swartz Creek for 1884–5; Mackinaw City for 1884–7; Ionia for 1884; Pentwater for 1886; Gulliver Lake and Birmingham for 1887–8.

EXHIBIT 19.—*Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year, and for each Month of the Year 1889, with Averages for the 25 Years 1864–88, and for 1888. Observations made at 7 A. M., 2 P. M. and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 25 years, 1864–88	79	87	86	83	70	69	76	73	76	79	79	82	86
1888	76	89	85	79	61	68	72	71	71	71	76	82	83
1889	76	84	85	72	68	64	79	78	71	72	69	84	82
In 1889 Greater than Av. for 25 years, 1864–88	.....	.....	.....	.....	.....	.....	3	5	.....	.....	.....	2	.....
In 1889 Less than Av. for 25 years, 1864–88	3	3	1	11	2	5	.....	.....	5	7	10	.....	4
In 1889 Greater than in 1888	.....	.....	.....	.....	7	.....	7	7	.....	1	.....	2	.....
In 1889 Less than in 1889	0	5	0	7	.....	4	.....	.....	0	.....	7	.....	1

TABLE V.—RELATIVE HUMIDITY.—*Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1889, at 16 Stations in Michigan; also Average lines for 9 Stations and for 5 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Per Cent of Saturation.—Relative Humidity.													
		Year.		Months, 1889.											
		Norm. §	1889.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations ‖	.....	.....	77	85	88	77	71	69	80	75	70	74	73	84	84
Av. for 5 stations¶	.....	.....	77	82	79	75	72	70	80	75	72	77	76	82	82
Marquette	U. P.	4 77	79	79	77	78	80	79	78	79	79	78	80	81	76
Gulliver Lake	U. P.	3 83	84	92	94	82	80	75	83	77	79	83	82	89	94
Manistee	N. W.	.....	75	78	73	72	66	68	82	73	72	73	78	79	85
Traverse City	N. W.	8 83	79	85	92	80	71	72	82	73	73	78	76	82	83
Alpena	N. E.	11 77	80	87	83	76	76	71	81	76	75	82	76	86	89
Harrisville	N. E.	2 62	62	59	45	52	60	59	68	67	67	70	66	68	65
Grand Haven	W.	.....	**	86	86	76	70	69	82	72	70	.....	n 79	82	81
Port Austin	B. & E.	.....	††	.....	.....	.....	m 69	g 75	83	e 77	h 73	k 79	f 75	d 84	j 82
Port Huron	B. & E.	11 77	76	81	78	74	70	69	81	75	70	76	74	81	80
Thornville	B. & E.	12 79	77	87	91	75	70	69	79	76	66	70	74	87	84
Alma	C.	.....	‡‡	.....	.....	a 77	74	71	c 84	71	65	77	76	84	84
Agr'l College	C.	26 79	76	84	85	72	68	64	79	78	71	72	69	84	82
Lansing, S. B. of H.¶¶	C.	11 72	72	79	79	68	65	63	77	72	68	68	66	e 77	77
Albion	S. C.	.....	§§	.....	.....	.....	.....	1 78	83	74	71	75	75	85	84
Ann Arbor	S. C.	9 78	80	a 86	85	a 80	75	77	c 86	79	70	74	a 71	86	88
Battle Creek	S. C.	2 87	86	96	80	94	88	77	80	87	77	c 84	87	90	b 88
Kalamazoo	S. C.	4 75	73	83	88	70	66	66	77	71	64	68	65	81	77
Marshall	S. C.	8 78	80	90	95	78	73	69	78	73	72	73	79	90	93
Birmingham	S. E.	3 76	77	s 83	82	b 76	d 71	70	c 80	b 74	b 68	c 76	a 72	84	82
Detroit	S. E.	12 72	75	83	82	78	69	a 65	79	71	65	74	71	82	80

NOTE.—The observations with the psychrometer at Marquette, Grand Haven, Port Huron and Detroit for 1889 were reduced (by tables in "Signal Service Order No. 41," 1881, and in "Instructions to Voluntary Observers," 1882), and the monthly means for those months were computed, by the observers at those stations. In all other cases the observations were reduced by Guyot's table, in Smithsonion Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor and Albion in 1889 were made by the observers there. All other computations in Table V. were made at the office of the State Board of Health.

* At the stations of the U. S. Signal Service during the year 1889, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 31.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 10.

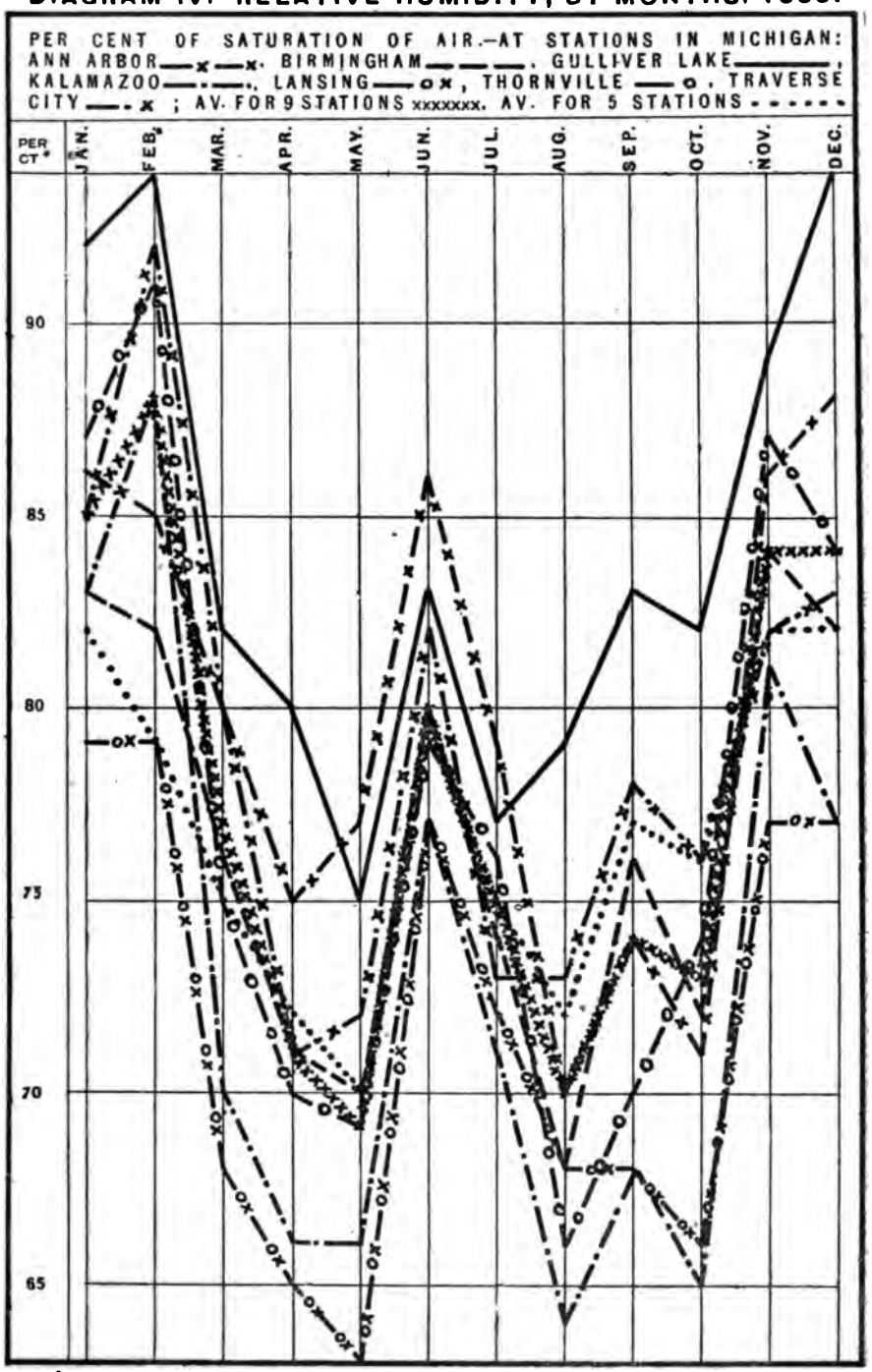
‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years included in the average.

[The remaining foot-notes are on page 46.]

Graphic representatives of 9 representatives lines in Table V. are given in Diagram IV., page 45.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MONTHS. 1889.



*SCALE, TEN PER CENT OF SATURATION TO 2.46 IN. VERTICALLY.

FOGS.

For the year 1889, fog was reported at 202 morning observations, at 24 afternoon observations (at about 2 P. M.), at 70 evening observations (at about 9 P. M.), and 53 times during the day, no special time being mentioned, in many cases the same fog or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 132 days.

EXHIBIT 20.—*Number of Different days on which Fog was Observed at One or more of 15 Stations in Michigan * in 1889, and in each month of the Year 1889.*

Year, 1889.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
132	8	8	8	8	14	20	11	11	12	19	9	9

NOTE—Graphic representations of statements in Exhibit 20 are given in Diagram V., page 47.

* This Exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Gulliver Lake, Manistee, Traverse City, Alpena, Port Austin, Port Huron, Thornville, Lansing, Otsego, Ann Arbor, Kalamazoo, Parkville, Birmingham and Detroit.

EXHIBIT 21.—*Number of Observations at which Fog was Observed in Michigan in 1889, and in each Month of the Year 1889. (Observation taken 3 times Daily, * at 15 Stations.†)*

Year, 1889.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8 49	16	16	42	19	23	51	16	16	25	59	40	26

* At the U. S. Signal Service Stations the observations were made at 8 A. M. and 8 P. M., 75th Meridian time.

† This exhibit contains statements only for those localities from which registers were received for every month of the year; the localities are stated in a foot-note to Exhibit 20, above.

[Foot-notes to Table IV., page 42.]

†† The average for 11 months in 1889 is 3.09. ‡‡ For 9 months, 4.18. §§ For 10 months, 4.01. ¶¶ For 8 months, 4.20.

‖‖ Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit C, page 28, Report for 1886.

NOTE.—The computations of Absolute Humidity at Ann Arbor and Albion for each month in 1889, were furnished by the observer there. All other computations in Table IV. were made at the office of the Secretary of the State Board of Health.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 89 observations. d For 88 observations.
e For 87 observations. f For 85 observations. g For 84 observations. h For 80 observatio s.
i For 78 observations. j For 73 observations. k For 64 observations. l For 54 observations.
m For 47 observations.

[Foot-notes to Table V., page 44.]

‖ This line is an average for only the stations at which observations were made tri-daily and from which statements, nearly complete, were received for every month in the year. It does not include Harrisville, Port Austin, Alma, Albion, Battle Creek, and the U. S. Signal Service Stations.

¶ This line is an average for 5 U. S. Signal Service Stations. It does not include Grand Haven.

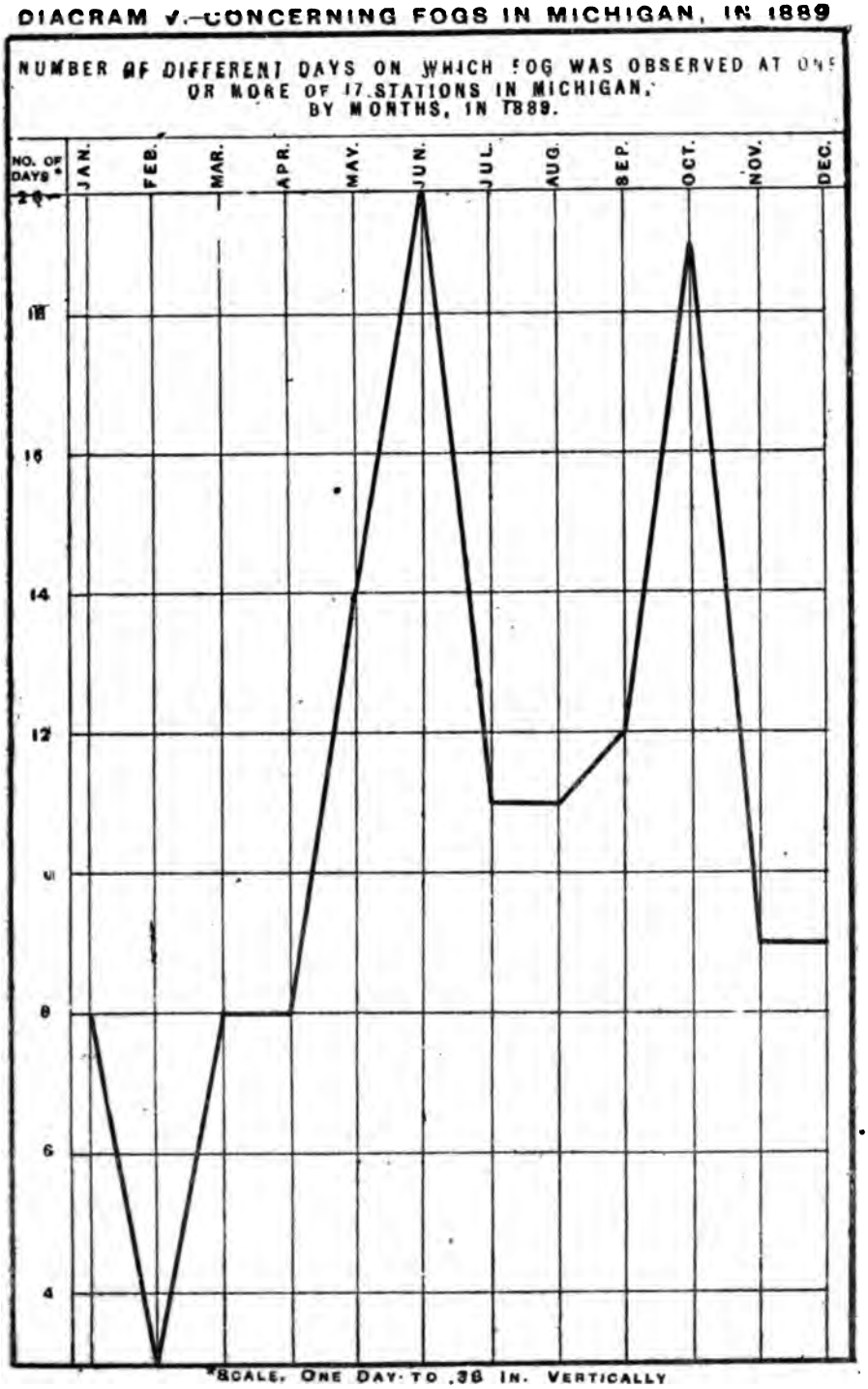
** The average for 11 months in 1889 is 78. †† For 9 months, 77. ‡‡ For 10 months, 76. §§ For 8 months, 78.

¶¶ Beginning with the year 1885, allowance must be made for Lansing in Table V, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D., page 29, Report for 1886.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 89 observations. d For 88 observations.
e For 87 observations. f For 85 observations. g For 84 observations. h For 80 observations.
i For 78 observations. j For 74 observations. k For 64 observations. l For 54 observations.
m For 47 observations. n For 45 observations.

DIACRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1889



*SCALE, ONE DAY TO .36 IN. VERTICALLY

EXHIBIT 22.—*Number of different Days on which Fog was recorded in 1889, and at 18 Stations*

Stations in Michigan.*	No. of Days in 1889.	January.			February.			Line Number.
		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
			A. M.	P. M.		A. M.	P. M.	
Marquette	21	0			0			1
								2
Gulliver Lake	22	16		7 to 10	0			3
								4
								5
								6
Manistee	15	23	7:15		0			7
								8
Traverse City	4	0			0			9
Alpena	18	16		5 to 8:30	16		6:28 to 9	10
		23	7:26		28	5 to 10		11
								12
								13
Grand Haven	41	4	7:15	7:15	16, 28	7:15	7:15	14
								15
		8, 16, 26	7:15		27	7:15		16
Port Austin	5	0			0			17
Port Huron	32	4		7:00†	16	8:50†		18
		5		8:35†				19
		6	11:00	till 5:00				20
								21
								22
Thornville	13	0			16		5:00†	23
								24
Alma	11							25
Lansing, S. B. of H.	13	0			28	7:00		26
								27
								28
Otsego	2	0			0			29
Albion	17							30
								31
Ann Arbor	13	8	7:00		28	7:00		32
Kalamazoo	11	0			28	7:00		33
								34
Parkville	28	8, 24			16		P. M.	35
					28		Night.	36
Birmingham	11	8	7:00		0			37
Detroit	17	0			16		7:28	38
					28	7:28		39

* The names of obeservers, their places of observation, and the counties in which the places are situated, are stated in Exhibit 1, page 10.

† Lifted in night.

in each Month, the dates and hours of observation‡ when Fogs were recorded in Michigan.

Line Number.	March.			April.			May.			June.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Days of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0	.....	.....	18	7:11	.....	19	7:11	.....	4, 19, 21	7:11	.....
2	.....	.....	.....	2	.....	7:15	.....	.....	.....	3, 14, 27	.....	7:11
3	1, 2, 3	10 of 1st night	to mid-of 3d.	2, 19, 26	7:00	.....	8, 17	7:00	.....	17, 19, 30	7:00	.....
4	.....	.....	.....	.....	.....	.....	18	.....	2 & 9	7	8 to 10	.....
5	.....	.....	.....	.....	.....	.....	24	.....	4 to 5	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	9	.....	9:00	.....	.....	.....
7	15	.....	7:15	0	.....	.....	20	7:15	.....	2,8,13, 17, 23	7:15	.....
8	16	7:15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	2	7:00	9:00	0	.....	.....	0	.....	.....	17	7:00	.....
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	6:30 to	12:30
11	2	.....	7:40 to 9	0	.....	.....	16	7:26	7:26	9	.....	7:26
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	8:30	2:00
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	.....	12:50to1:30
14	1,2,3,17	7:15	7:15	9	7:15	7:15	15	.....	7:15	4, 10, 15, 19, 28	7:15	.....
15	.....	.....	.....	.....	.....	.....	16	Early		.....	.....	.....
16	4	7:15	.....	19, 26	7:15	.....	27	Noon to	2:00	7, 8	.....	7:15
17	18	.....	.....	0	.....	.....	0	.....	.....	0	.....	.....
18	1	Early	till 2:00	2	Early till 10:00	.....	16, 31	Early till 8:30	.....	7, 8, 9	8 P. M. of 10 P. M.	of 7th till of 9th.
19	2	A. M.	P. M.*	11	.....	9:00*	.....	Early till 9:30	.....	15	.....	3:05*
20	4	8:20 to 10	.....	.....	.....	.....	.....	.....	.....	16, 17	9 P. M. of 10 A. M.	of 16th till of 17th.
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	27	Early till	10:00
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	Early till 10:00	.....
23	4	Morning	.....	0	.....	.....	31	Morning	.....	0	.....	.....
24	.....	.....	.....	9	Early.	.....	.....	.....	.....	.....	.....	.....
25	3	6:20 to 7:20	7:00	11	7:00	.....	24	6:30	.....	0	.....	.....
26	1	7 to 8:30	.....	0	.....	.....	30	Early to 11:00	.....	9	7:00	2 and 9
27	3	7 to 9	.....	.....	.....	.....	.....	.....	.....	28	7 to 9:30	.....
28	4	7	2 and 9*	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	0	.....	.....	26	7:00	.....	0	.....	.....	0	.....	.....
30	.....	.....	.....	.....	.....	.....	14, 15	.....	.....	9	7:00	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	23	.....	9:00
32	4	7:00	.....	0	.....	.....	0	.....	.....	0	.....	.....
33	3	7:00	9:00	11, 26	7:00	.....	0	.....	.....	0	.....	.....
34	4, 17	7:00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
35	1,3,4,17	.....	.....	10,20,26	.....	.....	1, 24	.....	.....	9	.....	Night.
36	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	Morning	.....
37	0	.....	.....	0	.....	.....	0	.....	.....	9, 16, 25	7:00	.....
38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
39	0	.....	.....	0	.....	.....	0	.....	.....	0	.....	.....

* Lifted in night.

‡ At the U. S. Signal Service Stations during 1889, the observations were made at 8 A. M. and 8 P. M., 75th Meridian time.

NOTE.—Registers were received, but with no fog recorded thereon, from Harrisville, Battle Creek, Hudson, Marshall and Tecumseh, for each month in 1889. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 22.—CONTINUED.—*Dates when*

Stations in Michigan.	July.			August.			September.			Line Number.
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.	
Marquette	8	7:11	7:11	14	7:11		1, 13	7:11		1
	9	7:11		19		7:11	12	7:11	7:11	2
Gulliver Lake	0			0			8	7:00		3
										4
										5
Manistee	27	7:15		0			0			6
										7
Traverse City	9, 11	7:00		0			0			8
Alpena	0			0			0			9
										10
										11
										12
Grand Haven	19	early till 8:40		7, 25	early till 7:00					13
				18		7:15				14
										15
										16
										17
Port Austin	0			0			0			18
										19
										20
Port Huron	19	till 10:00		0			9	till 11:20		21
							12	till 11:00		22
							29	till 9:30		23
										24
Thornville	19, 20, 21	Morning		24	7:00		9	Morning		25
										26
										27
Alma	0			0			24	Morning		28
										29
Lansing, S. B. of H.	18		9:00	0			14	7:00		30
										31
Otsego	0			0			0			32
Albion	0			0			0			33
										34
										35
Ann Arbor	19, 31	7:00		25, 29	7:00		9, 10, 14, 24	7:00		36
										37
Kalamazoo	0			0			0			38
										39
Parkville	5			1, 22, 25			10, 12, 17			40
Birmingham	2	7:00		14, 25	7:00		9, 10	7:00		41
Detroit	0			17, 25, 26	7:28		8, 9, 10, 11, 12, 24	7:28		42

Fogs were recorded in 1889.

Line Number.	October.			November.			December.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			20, 22	7:11		8, 18	7:11	
2				21	7:11	7:11			
3	15	7:00		19	7:00		16		2:00
4				20	7:00	2 & 9			
5				21	7:00	2:00			
6	8, 9, 10	8 P. M. of 8th	to 9 A. M. of 9th	0			0		
7	14, 16	7:15							
8	0			0			0		
9	C			9	Night		12		8:00*
10				13	till 11:00		16, 17	A. M.	P. M.*
11				19	A. M.	P. M.*	18	early till	7:30
12				21	till 11:30				
13	10	till 9:00		9	early till 10:00		16		7:15
14	16	7:15		19		7:15	24, 28	7:15	
15	18, 29	till 8:15		20		7 till Morning			
16	21	till 10:00							
17	25	7:15							
18	19	7:00		9	7:00		0		
19				20	7:00	2:00			
20				21		2 & 9			
21	12	till 9:00		9	early till	2:00	18	7:30	
22	16	till 10:30		17	till 10:30				
23	18	7:30		20, 21	2:05 P. M. of 20th till 10:20 of 21st.				
24	19	till 10:00							
25	0			9		2:00	7	12 M. till	Night
26				19	7 till	4:00	17	A. M.	P. M.
27							18	Morning	
28	10, 12, 15, 16	A. M.	P. M.	0			0		
29	18, 24, 28	Morning							
30	10	till 9:30		9	7:00		18	7:00	2:00
31			16	till 9:00					
32	10	7.00		0			0		
33	10, 16, 21, 29, 31	7:00		13, 19	7:00		0		
34	12		2:00	8		9:00			
35	14, 15, 20, 28		9:00						
36	0			19	7:00				
37				20		9:00	0		
38	21	7:00	2 & 9	0			0		
39	22, 23, 29, 30	7:00							
40	10, 29, 31			19			5, 7, 17		
41	24	7:00		21	7:00		0		
42	10, 16 21, 24	7:28		19	7:28		18	7:28	

* Lifted in night.

EXHIBIT 23.—*Average Per Cent of Cloudiness, by Year and Months, in 1889, Compared with Annual and Monthly Averages for 1888, and for the Twelve Years 1877-88. These Averages are for Groups of several Stations in Michigan.*

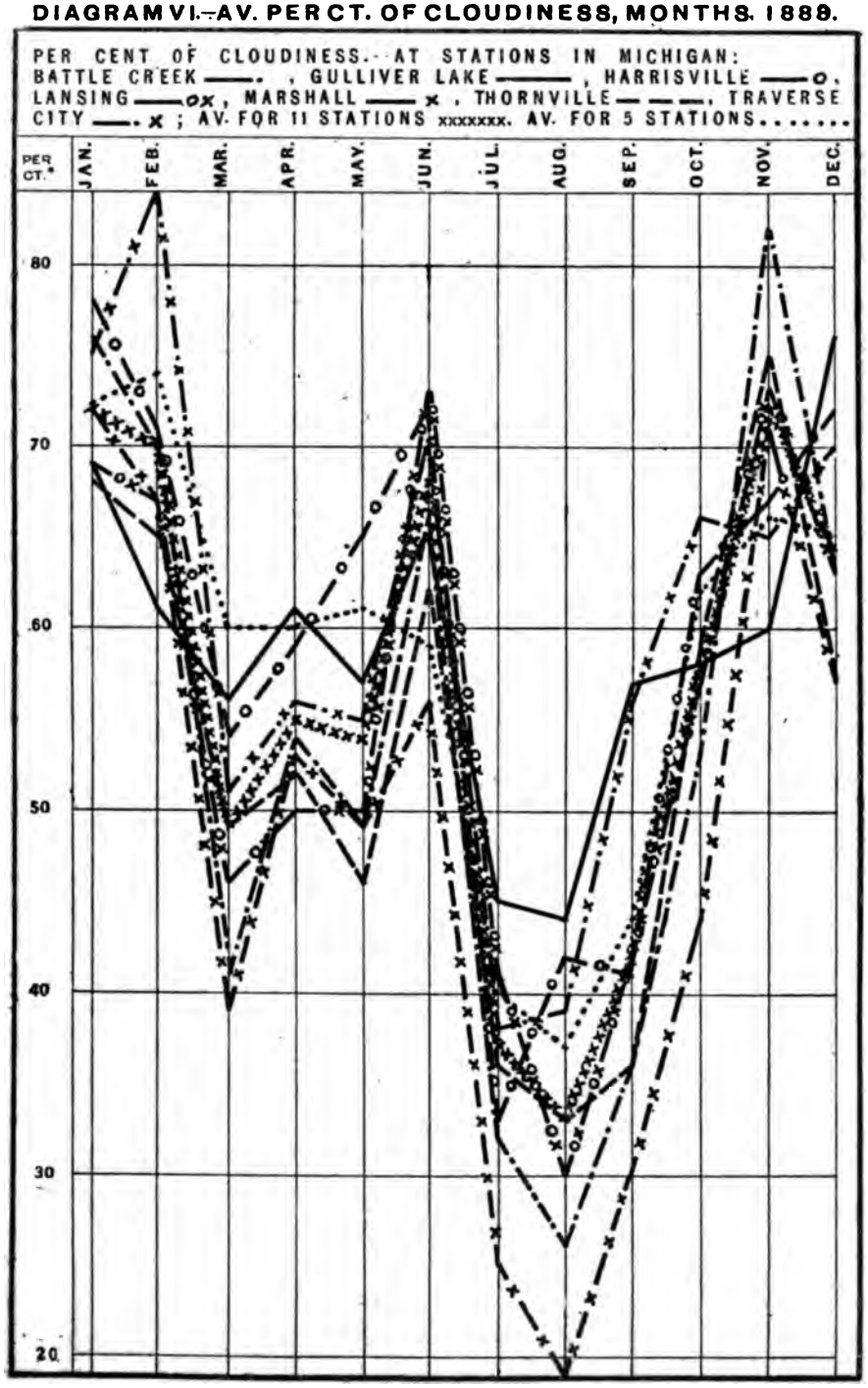
Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877-88*.	56	70	63	59	52	48	47	42	44	46	58	68	77
1888 (11 stations).....	57	75	64	58	47	64	43	45	45	40	67	64	73
1889 (11 stations).....	56	72	70	49	55	54	68	37	33	42	58	72	64
In 1889 Greater than Av. for 12 years, 1877-88.....	0	2	7	.....	3	6	21	.....	.....	.....	.....	4	.....
In 1889 Less than Av. for 12 years, 1877-88	.....	.....	.....	10	.....	.....	.....	5	11	4	0	.....	13
In 1889 Greater than in 1888.....	.....	.....	6	.....	8	.....	25	.....	.....	2	.....	8	.....
In 1889 Less than in 1888	1	3	.....	9	.....	10	.....	8	12	.....	9	.....	9

* Thornville, Kalamazoo for 1877-88; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-5; Nirvana for 1877-9 and the first four months of 1880; Reed City for last eight months of 1880 and 1881-5; Detroit for 1877 and 1879-87; Niles for 1878-81; Benton Harbor for 1877-8 and 1880; Coldwater, Woodmore Cemetery (near Detroit) for 1877-9; Otisville for 1878-80 and 1882; Marquette for 1879-84 and 1886-7; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-88; Washington for 1879-83; Ypsilanti for 1877 and 1879; Fife Lake for 1877; Ionia for 1880 and 1883-5; Adrian for 1880; Hillsdale for 1880 and 1882-4; Marshall for 1881-8; Parkville for 1881-2; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Harrisville for 1882 and 1885-8; Hastings for 1882; Traverse City for 1882-8; Port Austin for 1883; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Pentwater, East Saginaw for 1886; Otsego for 1886-7; Gulliver Lake and Birmingham for 1887-8; Petoskey for 1878-9; Escanaba 1880-7; Ann Arbor for 1880-8.

EXHIBIT 24.—*Comparison of the Average Per Cent of Cloudiness in the Year and each Month of the Year 1889, with Averages for the Twenty-five Years, 1864-88, and for the Year 1888. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 25 years, 1864-88.	58	73	64	62	56	51	49	46	46	49	59	67	76
1888.....	58	77	64	62	49	64	44	43	42	45	70	62	72
1889.....	56	71	73	51	56	52	65	42	32	40	64	72	55
In 1889 Greater than Av. for 25 years, 1864-88.....	.....	.....	9	.....	.....	1	16	.....	.....	.....	5	5	.....
In 1889 Less than Av. for 25 years, 1864-88.....	2	2	.....	11	0	.....	.....	4	14	9	.....	.....	21
In 1889 Greater than in 1888.....	.....	.....	9	.....	7	.....	21	.....	.....	.....	.....	10	.....
In 1889 Less than in 1888.....	2	6	.....	11	.....	12	.....	1	10	5	6	.....	17

DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, MONTHS. 1889.



*SCALE, TEN PER CENT TO .98 IN. VERTICALLY

TABLE VI.—*Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1889, at each of 17 Stations in Michigan, and also the Average lines for 11 Stations, and for 5 Stations. Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M., *by Observers for the State Board of Health, †and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.††	Average Per Cent of Cloudiness.													
		Year.		Months, 1889.											
		Norm. ‖	1889.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 11 Stations§	.....	.....	56	72	70	49	55	54	68	37	33	42	58	72	64
Av. for 5 Stations¶	.....	.....	58	72	74	60	60	61	59	40	37	44	62	66	65
Marquette	U. P.	4 60	59	65	68	62 f	60	59	47	45	42	62	69	57	70
Gulliver Lake	U. P.	3 55	59	69	61	56	61	57	65	45	44	57	58	60	76
Manistee	N. W.	.....	58	80	96	59 b	64 e	67 b	54 g	34 b	29 f	39 f	47 b	64 e	59
Traverse City	N. W.	6 60	60	75	84	51	56	55	70	38	39	56	66	65	70
Alpena	N. E.	11 58	61	78	71	59	62	60	68	40	44	48	62	68	70
Harrisville	N. E.	5 59	60	78	71	54	59	65	72	33	42	41	63 x	67	72
Grand Haven	W.	.....	**	80 t	89 u	51 n	60 p	66 p	60 s	37 l	34 q	 v	44 m	73 r	67 s
Port Austin	B. & E.	2 41	40	59	48	34	44	33	54	13	22	20	56	54	47
Port Huron	B. & E.	11 57	59	71	71	62	56	62	63	42	41 a	38	71	71	65
Thornville	B. & E.	13 52	53	68	65	49	52	46	62	36	33	36	59 d	75	57
Alma	C.	.....	††	.....	.....	42	53	54	53	25	20	32	44	69	59
Agr'l College	C.	26 58	56	71 a	73	51	56	52	65	42	32	40	64	72	55
Lansing, S. B. of H.	C.	11 56	55	69 a	67 n	46 c	50 d	50	73	41 b	30	42 f	57 k	73 d	63 a
Otsego	S. W.	.....	‡‡	57	59	33	42	43 w	47 h	28	.....	38	44	61	51
Albion	S. C.	.....	§§	.....	.....	.....	.....	60	64	40	30	44	63	80	66
Ann Arbor	S. C.	10 59	56	71	66	52 b	55	54	73	36	33	42	58	74	60
Battle Creek	S. C.	2 54	54	76	70	41	54	49	66	32	26	36	53	82	63
Kalamazoo	S. C.	13 65	57	75	78	50	51	53	70	38	28	45	54	78	68
Marshall	S. C.	9 54	49	72 b	67 b	39 b	53 g	49 e	56 e	25 b	19 h	30 o	44 j	71 e	57 e
Birmingham	S. E.	3 59	60	72	67	54	53	60	74	46	42	41	62	80	64
Detroit	S. E.	11 56	55	66	62	58	59	55	64	38	31	34	60	72	60

* At Stations of the U. S. Signal Service, during the year 1889, the observations were made at 8 A. M., and 8 P. M., 75th meridian time. The corresponding local time for each of the stations is stated in the star (*) foot note to Table I., page 31.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10.

‡ The full names of divisions and the counties in each division are stated in Exhibit I. in a paper which follows on weekly reports of sickness.

‖ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

NOTE TO TABLE VI.—Computations of average per cent of cloudiness were made and furnished by the observers at Marquette, Manistee, Ann Arbor, Grand Haven, Alpena, Port Huron and Detroit for each month in 1889. At Albion, Aug. to Dec. All other computations in Table VI. were made at the office of the State Board of Health.

[The remaining foot-notes are on page 55.]

Graphic representations of 9 representative lines in Table VI., are given in Diagram No. VI., page 53.

EXHIBIT 25.—*Dates of Auroras Observed and recorded at 4 Stations in Michigan during the Year 1889.*

Stations.	Dates of Auroras Recorded in 1889.											
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	October.	Novemb'r	Decemb'r
Gulliver Lake....	28	17, 28	4, 6, 19	.....	.....	.....	.....	.....	.....	18, 18, 20	17, 18, 26	22, 26, 31
Alpena	.....	.....	5	.....	.....	.....	20	.....	.....	.....	.....	.....
Traverse City	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Thornville	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....

[Foot-notes to Table VI., page 54.]

§ This line is an average for only the stations at which tri-daily observations were made and from which statements, nearly complete, were received for every month of the year. It does not include the line for Otsego, Port Austin, Alma, Albion and the U. S. Signal Service Stations.

¶ This line is an average for five U. S. Signal Service Stations. It does not include Grand Haven.

** The average for 11 months is 60. †† For 10 months, 45. ‡‡ For 11 months, 46. §§ For 8 months, 56.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.
i For 84 observations. j For 83 observations. k For 82 observations. l For 81 observations.
m For 80 observations. n For 76 observations. o For 75 observations. p For 74 observations.
q For 72 observations. r For 71 observations. s For 69 observations. t For 67 observations.
u For 60 observations. v For 55 observations. w For 54 observations. x For 37 observations.

SUNSHINE AND CLOUDS.

The following is a statement of the days in each month in 1889, which where "All or nearly all sunshine," "Clear," "Fair," "Partly cloudy," "All or nearly all cloudy," and the hours of sunshine during each month, as reported by observers at stations in Michigan:

LANSING.

JAN.—Sunny, 2, 3, 22, 23, 24, 25, 28—7 days. Cloudy, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 27, 30—17 days. No record for the rest of the month.

FEB.—Sunny, 14, 20, 21, 23, 24, 27, 28—7 days. Cloudy, 3, 4, 5, 7, 8, 9, 11, 13, 15, 16, 17, 18, 25, 26—14 days. No record for the rest of the month.

MARCH.—Sunny, 3, 5, 11, 12, 14, 15, 16, 17, 19, 20, 22, 23, 24, 25, 26, 27, 28, 30—18 days. Cloudy, 1, 2, 4, 6, 8, 9, 13, 18, 21, 29, 31—11 days. No record for the rest of the month.

APRIL.—Sunny, 6, 7, 9, 10, 13, 14, 15, 16, 17, 20, 21, 22, 26—13 days. Cloudy, 1, 2, 3, 4, 5, 11, 12, 24, 25, 27, 28, 29, 30—13 days. No record for the rest of the month.

MAY.—Sunny, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 17, 18, 19, 20, 24, 28—17 days. Cloudy, 1, 2, 13, 15, 16, 21, 22, 23, 25, 26, 27, 29, 30, 31—14 days.

JUNE.—Sunny, 5, 6, 11, 12, 15, 19, 25, 26, 27, 28, 29, 30—12 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 13, 14, 16, 17, 18, 20, 21, 22, 23, 24—18 days.

JULY.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15, 16. 18, 21, 22, 24, 25, 26, 27, 30, 31—22 days. Cloudy, 3, 10, 14, 17, 19, 20, 23, 28, 29—9 days.

AUG.—Sunny, 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 16, 17, 18, 19, 21, 22, 23, 25, 27, 28, 29, 30, 31—23 days. Cloudy, 8, 9, 13, 14, 15, 20, 24, 26—8 days.

SEPT.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 22, 23, 24, 25, 27, 28—20 days. Cloudy, 15, 16, 17, 18, 19, 20, 21, 26, 29, 30—10 days.

OCT.—Sunny, 2, 4, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 21, 23—16 days. Cloudy, 1, 3, 5, 6, 12, 20, 22, 24, 25, 26, 27, 28, 29, 30, 31—15 days.

NOV.—Sunny, 3, 4, 6, 16, 17—5days. Cloudy, 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19—14 days. No record for the rest of the month.

DEC.—Sunny, 1, 6, 9, 11, 15, 23, 27, 30, 31—9 days. Cloudy, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, 28, 29—20 days. No record for the rest of the month.

GULLIVER LAKE.

JAN.—Hours of sunshine, 92.

FEB.—Clear, 9; fair, 10; cloudy, 9; rainy, 15; hours of sunshine, 128½.

MARCH.—Clear, 10; fair, 7; cloudy, 14; rainy, 6; hours of sunshine, 172½.

APRIL.—Clear, 10; fair, 8; cloudy, 12; rainy 13; hours of sunshine, 182½.
MAY.—Hours of sunshine, 221.
JUNE.—Hours of sunshine, 210.
JULY.—Hours of sunshine, 315½.
AUG.—Hours of sunshine, 256¼.
SEPT.—Hours of sunshine, 178½.
OCT.—Hours of sunshine, 164.
NOV.—Hours of sunshine, 125.
DEC.—Hours of sunshine, 78.

MANISTEE.

JAN.—Sunny, 2, 3, 11, 13, 14, 21, 24, 25—8 days. Cloudy, 1, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, 17, 18, 19, 20, 22, 23, 26, 27—19 days. No record for the rest of the month.

FEB.—Cloudy, 28 days.

MARCH.—No record made on register.

APRIL.—Sunny, 6, 7, 9, 10, 13, 14, 15, 16, 20, 21, 22, 25, 26—13 days. Cloudy, 1, 2, 3, 4, 5, 8, 11, 12, 17, 18, 19, 23, 24, 27, 28, 29—16 days. No record for the rest of the month.

MAY.—Sunny, 2, 3, 4, 5, 7, 8, 9, 11, 12, 14, 22, 24, 25—13 days. Cloudy, 1, 6, 10, 13, 15, 16, 17, 18, 19, 20, 21, 23, 26—13 days. No record for the rest of the month.

JUNE.—Sunny, 5, 6, 12, 13, 14, 15, 24, 25, 26, 27, 28, 29, 30—13 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23—17 days.

JULY.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 11, 13, 15, 16, 17, 20, 21, 22, 23, 24, 25—19 days. Cloudy, 3, 19. Partly cloudy, 10, 12, 14, 18, 26, 27, 28, 29, 30, 31—10 days.

AUG.—Sunny, 3, 4, 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—23 days. Cloudy, 8, 13, 14, 18, 20, 21—6 days. Partly cloudy, 1, 2.

SEPT.—Sunny, 1, 3, 6, 7, 8, 9, 11, 12, 13, 14, 16, 19, 21, 22, 28—15 days. Cloudy, 2, 4, 5, 10, 15, 17, 18, 20, 23, 24, 25, 26, 27, 29, 30—15 days.

OCT.—Sunny, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 23, 24, 28, 30—20 days. Cloudy, 1, 5, 6, 19, 21, 22, 25, 26, 27, 29, 31—11 days.

NOV.—Sunny, 6, 7, 8, 9, 10, 15, 16, 17, 18—9 days. Cloudy, 1, 2, 3, 4, 5, 11, 12, 13, 14, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30—21 days.

DEC.—Sunny, 3, 8, 9, 15, 25, 26, 27, 30, 31—9 days. Cloudy, 1, 2, 4, 5, 6, 7, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 28, 29—22 days.

ALPENA.

JAN.—Sunny, 23, 24, 25, 28, 29—5 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 30, 31—26 days.

FEB.—Sunny, 14, 23, 24, 25—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 28—24 days.

MARCH.—Sunny, 3, 5, 10, 12, 16, 18, 19, 21, 22, 23, 24, 25—12 days. Cloudy, 1, 2, 4, 6, 7, 8, 9, 11, 13, 14, 15, 17, 20, 26, 27, 28, 29, 30, 31—19 days.

APRIL.—Sunny, 6, 7, 9, 14, 15, 16, 21, 22, 26—9 days. Cloudy, 1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 17, 18, 19, 20, 23, 24, 25, 27, 28, 29, 30—21 days.

MAY.—Sunny, 3, 4, 5, 6, 7, 8, 9, 11, 12, 25, 26—11 days. Cloudy, 1, 2, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30, 31—20 days.

JUNE.—Sunny, 6, 12, 13, 14, 17, 18, 23, 24, 25, 29, 30—11 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 15, 16, 19, 20, 21, 22, 26, 27, 28—19 days.

JULY.—Sunny, 1, 2, 4, 5, 7, 8, 11, 14, 15, 16, 17, 20, 21, 23, 24—15 days. Cloudy, 3, 6, 9, 10, 12, 13, 18, 19, 22, 25, 26, 27, 28, 29, 30, 31—16 days.

AUG.—Sunny, 5, 6, 7, 10, 11, 15, 16, 17, 19, 21, 22, 23, 24, 28, 29, 30, 31—17 days. Cloudy, 1, 2, 3, 4, 8, 9, 12, 13, 14, 18, 20, 25, 26, 27—14 days.

SEPT.—Sunny, 1, 6, 7, 8, 9, 11, 12, 13, 16, 24—10 days. Cloudy, 2, 3, 4, 5, 10, 14, 15, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30—20 days.

OCT.—Sunny, 8, 13, 14, 15, 17, 21, 23, 27—8 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 16, 18, 19, 20, 22, 24, 25, 26, 28, 29, 30, 31—23 days.

NOV.—Sunny, 6, 7, 8, 9, 10, 15, 16, 17, 18, 30—10 days. Cloudy, 1, 2, 3, 4, 5, 11, 12, 13, 14, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29—20 days.

DEC.—Sunny, 6, 9, 15, 25, 26, 27, 30, 31—8 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 28, 29—23 days.

GRAND HAVEN.

JAN.—Sunny, 2, 3, 22, 23, 24, 25—6 days. Cloudy, 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 26, 27, 28, 29, 30, 31—25 days.

FEB.—Sunny, 25, 27, 28. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26—25 days.

MARCH.—Sunny, 5, 10, 12, 15, 16, 19, 20, 22, 23, 24, 25, 26—12 days. Cloudy, 1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 17, 18, 21, 27, 28, 29, 30, 31—19 days.

APRIL.—Sunny, 4, 6, 7, 10, 13, 14, 15, 16, 20, 21, 22, 25, 26—13 days. Cloudy, 1, 2, 3, 5, 8, 9, 11, 12, 17, 18, 19, 23, 24, 27, 28, 29, 30—17 days.

MAY.—Sunny, 1, 3, 4, 6, 7, 8, 20, 24, 25—9 days. Cloudy, 2, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31—22 days.

JUNE.—Sunny, 5, 6, 11, 12, 13, 14, 20, 21, 23, 24, 26, 27, 30—13 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 15, 16, 17, 18, 19, 22, 25, 28, 29—17 days.

July.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 18, 20, 21, 22, 23, 24, 25, 28, 30, 31—24 days. Cloudy, 12, 14, 17, 19, 26, 27, 29—7 days.

AUG.—Sunny, 3, 4, 5, 6, 9, 10, 11, 12, 14, 15, 16, 17, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—24 days. Cloudy, 1, 2, 7, 8, 13, 18, 20—7 days.

OCT.—Sunny, 9, 10, 11, 13, 14, 15, 17, 18, 19, 20, 23, 28, 29—13 days. Cloudy, 12, 16, 21, 22, 24, 25, 26, 27, 30, 31—10 days. No record for the rest of the month.

NOV.—Sunny, 3, 6, 17, 25—4 days. Cloudy, 1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30—26 days.

DEC.—Sunny, 1, 6, 8, 9, 11, 12, 15, 25, 26, 27, 30, 31—12 days. Cloudy, 2, 3, 4, 5, 7, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 28, 29—19 days.

PORT HURON.

JAN.—Cloudless, 3, 22, 24, 25, 29—5 days. Partly Cloudy, 1, 2, 4, 11, 12—5 days. Cloudy, 5, 6, 7, 8, 9, 10 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 27, 28, 30, 31—21 days.

FEB.—Cloudless, 19, 20, 23, 25, 27, 28—6 days. Partly Cloudy, 6, 10, 13, 14, 21, 24—6 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 15, 16, 17, 18, 22, 26—16 days.

MARCH.—Cloudless, 3, 11, 12, 14, 15, 16, 17, 23, 24, 25, 26—11 days. Partly Cloudy, 5, 7, 10, 22, 27, 28—6 days. Cloudy, 1, 2, 4, 6, 8, 9, 13, 18, 19, 20, 21, 29, 30, 31—14 days.

APRIL.—Cloudless, 7, 9, 10, 13, 14, 15, 16, 20, 21, 22—10 days. Partly Cloudy, 6, 8, 17, 23, 26—5 days Cloudy, 1, 2, 3, 4, 5, 11, 12, 18, 19, 24, 25, 27, 28, 29, 30—15 days.

MAY.—Cloudless, 4, 5, 7, 8, 9, 12, 14—7 days. Partly Cloudy, 1, 3, 6, 11, 17, 18, 19, 22, 26, 28—10 days. Cloudy, 2, 10, 13, 15, 16, 20, 21, 23, 24, 25, 27, 29, 30, 31—14 days.

JUNE.—Cloudless, 6, 12, 20, 23, 24, 26, 29—7 days. Partly Cloudy, 11, 13, 14, 17, 21, 25, 28, 30—8 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 10, 15, 16, 18, 19, 22, 27—15 days.

JULY.—Cloudless, 4, 5, 6, 7, 8, 11, 13, 15, 16, 21, 24, 29, 31—13 days. Partly Cloudy, 2, 9, 12, 17, 20, 22, 23, 25, 28—9 days. Cloudy, 1, 3, 10, 14, 18, 19, 26, 27, 30—9 days.

AUG.—Cloudless, 3, 4, 5, 6, 7, 10, 11, 22, 24, 28, 29, 30, 31—13 days. Partly Cloudy, 1, 2, 12, 15, 16, 17, 18. 19, 20, 21, 23, 25, 26, 27—14 days. Cloudy, 8, 9, 13, 14—4 days.

SEPT.—Cloudless, 1, 6, 7, 8, 10, 11, 22, 24, 28—9 days. Partly Cloudy, 2, 4, 12, 13, 15, 17, 18, 21, 23, 25, 26, 27—12 days. Cloudy, 3, 5, 9, 14, 16, 19, 20, 29, 30—9 days.

OCT.—Cloudless, 8, 15, 16, 23—4 days. Partly cloudy, 2, 3, 4, 9, 10, 11, 19—7 days. Cloudy, 1, 5, 6, 7, 12, 13, 14, 17, 18, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31—20 days.

NOV.—Cloudless, 4, 5, 6, 16, 17, 24, 30—7 days. Partly cloudy, 3, 15, 25, 26—4 days. Cloudy, 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 27, 28, 29—19 days.

DEC.—Cloudless, 6, 9, 15, 23, 25, 26, 27, 30—8 days. Partly cloudy, 1, 7, 11, 12, 19, 28, 29, 31—8 days. Cloudy, 2, 3, 4, 5, 8, 10, 13, 14, 16, 17, 18, 20, 21, 22, 24—15 days.

THORNVILLE.

JAN.—Sunny, 2, 3, 13, 19, 22, 23, 24, 25, 26, 29—10 days. Cloudy, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 20, 27, 30, 31—15 days. Fair, 1, 4, 11, 12, 21, 28—6 days.

FEB.—Sunny, 6, 10, 13, 14, 19, 20, 21, 23, 25, 28—10 days. Cloudy, 2, 4, 8, 9, 16, 17, 18, 22, 26, 27—10 days. Fair, 1, 3, 5, 7, 11, 12, 15, 24—8 days.

MARCH.—Sunny, 3, 5, 7, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 28, 29—17 days. Cloudy, 1, 2, 4, 6, 8, 9, 10 20, 21, 30—10 days. Fair, 19, 22, 27, 29—4 days.

APRIL.—Sunny, 4, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 20, 21, 22, 25, 26—16 days. Cloudy, 2, 3, 5, 12, 28, 29, 30 —7 days. Fair, 1, 11, 18, 19, 23, 24, 27—7 days.

MAY.—Sunny, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 17, 18, 20, 26, 28—15 days. Cloudy, 2, 15, 16, 19, 21, 27, 29, 30—8 days. Fair, 23, 25. No record for the rest of the month.

JUNE.—Sunny, 6, 11, 12, 13, 14, 17, 18, 20, 26, 28, 29, 30—12 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 10, 22—9 days. Fair, 9, 15, 16, 19, 21, 23, 24, 25, 27—9 days.

JULY.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15, 16, 17, 20, 21, 23, 24, 25, 26, 27, 30, 31—23 days. Cloudy, 14, 19, 29—3 days. Fair, 3, 10, 18, 22, 28—5 days.

AUG.—Sunny, 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—25 days. Cloudy, 9, 13, 14, 15—4 days. Fair, 8, 17.

SEPT.—Sunny, 1, 2, 6, 7, 8, 10, 11, 12, 13, 22, 23, 24, 27, 28—14 days. Cloudy, 5, 16, 20, 25, 30—5 days. Fair, 3, 4, 9, 14, 15, 17, 18, 19, 21, 26, 29—11 days.

OCT.—Sunny, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 23, 28—14 days. Cloudy, 1, 5, 6, 7, 22, 24, 25, 26, 27, 29, 30—11 days. Fair, 2, 3, 4, 12, 13—5 days.

NOV.—Sunny, 4, 6, 16, 17, 24, 25, 29, 30—8 days. Cloudy, 1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 26, 27, 28—18 days. Fair, 3, 5, 7, 23—4 days.

DEC.—Sunny, 1, 6, 9, 11, 12, 15, 19, 23, 25, 26, 27, 28, 30, 31—14 days. Cloudy, 2, 3, 4, 5, 8, 10, 13, 14, 16, 17, 18, 20, 22, 24, 29—15 days. Fair, 7, 21.

ANN ARBOR.

JAN.—Sunny, 2, 3, 22, 24, 25, 26—6 days. Cloudy, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 27, 30, 31—21 days. No record for the rest of the month.

FEB.—Sunny, 21, 28. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 22, 24, 25, 26—21 days. No record for the rest of the month.

MARCH.—Sunny, 3, 12, 14, 15, 16, 17, 19, 23, 24, 25, 26, 28, 30—13 days. Cloudy, 1, 2, 4, 6, 7, 8, 9, 10, 18, 20, 21, 31—12 days. No record for the rest of the month.

APRIL.—Sunny, 6, 7, 10, 13, 14, 15, 16, 17, 20, 21, 22, 23—12 days. Cloudy, 1, 2, 3, 4, 5, 9, 11, 12, 19, 24, 25, 26, 27, 28, 29, 30—16 days. No record for the rest of the month.

MAY.—Sunny, 3, 4, 5, 7, 11, 14, 18, 28—8 days. Cloudy, 2, 10, 13, 15, 16, 20, 21, 22, 23, 25, 27, 29, 30, 31—14 days. No record for the rest of the month.

JUNE.—Sunny, 6, 30. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 22, 23, 24, 25, 27—20 days. No record for the rest of the month.

JULY.—Sunny, 4, 6, 7, 8, 9, 11, 12, 13, 15, 16, 24, 25, 27—13 days. Cloudy, 3, 5, 14, 18, 20, 23, 29, 30—8 days. No record for the rest of the month.

AUG.—Sunny, 3, 5, 6, 7, 11, 12, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31—18 days. Cloudy, 4, 8, 9, 10, 13, 14—6 days. No record for the rest of the month.

SEPT.—Sunny, 1, 6, 7, 8, 11, 12, 23, 24, 28—9 days. Cloudy, 3, 5, 14, 15, 16, 17, 18, 19, 20, 21, 25, 29, 30—13 days. No record for the rest of the month.

OCT.—Sunny, 11, 14, 15, 18, 20, 23—6 days. Cloudy, 1, 5, 6, 9, 12, 13, 16, 21, 22, 24, 25, 26, 27, 29, 30, 31—16 days. No record for the rest of the month.

NOV.—Sunny, 4, 6, 16, 25, 30—5 days. Cloudy, 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29—24 days. No record for Nov. 3.

DEC.—Sunny, 6, 9, 11, 12, 23, 25, 26, 27, 28, 31—10 days. Cloudy, 2, 3, 4, 5, 7, 8, 10, 13, 14, 16, 17, 18, 20, 21, 22, 24, 29, 30—18 days. No record for the rest of the month.

ALBION.

MAY.—Sunny, 3, 4, 5, 7, 28—5 days. Cloudy, 2, 13, 15, 16, 21, 23, 25, 29, 30, 31—10 days. No record for the rest of the month.

JUNE.—Sunny, 5, 6, 12, 23, 24—5 days. Fair, 4, 11, 18, 14, 15, 17, 20, 21, 25, 26, 27, 28, 30—13 days. Cloudy, 1, 2, 3, 7, 8, 9, 10, 16, 18, 19, 22, 29—12 days.

JULY.—Sunny, 1, 4, 5, 6, 7, 9, 11, 16, 22, 24, 25, 31—12 days. Fair, 2, 8, 12, 13, 15, 17, 20, 21, 23, 27, 28, 30—12 days. Cloudy, 3, 10, 14, 18, 19, 26, 29—7 days.

AUG.—Sunny, 3, 6, 7, 10, 11, 12, 17, 18, 19, 23, 25, 27, 28, 29, 30, 31—16 days. Fair, 1, 2, 4, 5, 16, 20, 21, 22, 24, 26—10 days. Cloudy, 8, 9, 13, 14, 15—5 days.

SEPT.—Sunny, 1, 6, 7, 8, 11, 12, 14, 19, 22, 28—10 days. Fair, 3, 9, 10, 13, 18, 20, 21, 23, 24, 26, 27—11 days. Cloudy, 2, 4, 5, 15, 16, 17, 25, 29, 30—9 days.

OCT.—Sunny, 3, 4, 7, 10, 11, 14, 15, 18, 23—9 days. Fair, 2, 5, 8, 9, 13, 16, 17, 19, 28—9 days. Cloudy, 1, 6, 12, 22, 24, 25, 26, 27, 29, 30, 31—11 days. Smoky, 20, 21.

NOV.—Sunny, 6, 16, 25—3 days. Fair, 3, 4, 15, 17, 24, 30—6 days. Cloudy, 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29—21 days.

DEC.—Sunny, 6, 9, 26, 31—4 days. Fair, 1, 8, 11, 12, 13, 15, 19, 23, 24, 25, 27, 28, 30—13 days. Cloudy, 2, 3, 4, 5, 7, 10, 14, 16, 17, 18, 20, 21, 22, 29—14 days.

KALAMAZOO.

JAN.—Sunny, 2, 3, 22, 24, 25—5 days. Cloudy, 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 27, 28, 29, 30, 31—26 days.

FEB.—Sunny, 21, 28. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27—26 days.

MARCH.—Sunny, 3, 5, 6, 11, 12, 13, 16, 19, 22, 23, 24, 25, 26, 27, 28, 30—16 days. Cloudy, 1, 2, 4, 7, 8, 9, 10, 14, 15, 17, 18, 20, 21, 29, 31—15 days.

APRIL.—Sunny, 6, 7, 10, 13, 14, 15, 16, 17, 20—9 days. Cloudy, 1, 2, 3, 4, 5, 8, 9, 11, 12, 18, 19—11 days. No record for the rest of the month.

MAY.—Sunny, 1, 3, 5, 6, 7, 8, 10, 14, 17, 18, 19, 24, 28—13 days. Cloudy, 2, 4, 9, 11, 12, 13, 15, 16, 20, 21, 22, 23, 25, 26, 27, 29, 30, 31—18 days.

JUNE.—Sunny, 5, 6, 13, 26, 30—5 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29—25 days.

JULY.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 11, 13, 15, 16, 24, 25, 27, 31—16 days. Cloudy, 3, 10, 12, 14, 17, 18, 19, 20, 21, 22, 23, 26, 28, 29, 30—15 days.

AUG.—Sunny, 2, 3, 5, 6, 7, 11, 12, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—21 days. Cloudy, 1, 4, 8, 9, 10, 13, 14, 15, 20, 21 —10 days.

SEPT.—Sunny, 1, 6, 7, 8, 10, 11, 12, 13, 14, 19, 23, 27, 28—13 days. Cloudy, 2, 3, 4, 5, 9, 15, 16, 17, 18, 20, 21, 22, 24, 25, 26, 29, 30—17 days.

OCT.—Sunny, 2, 3, 4, 7, 9, 10, 11, 14, 15, 18, 19, 23—12 days. Cloudy, 1, 5, 6, 8, 12, 13, 16, 17, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31—19 days.

NOV.—Sunny, 3, 6, 16, 25, 30—5 days. Cloudy, 1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29—25 days.

DEC.—Sunny, 1, 6, 9, 11, 12, 15, 23, 26, 27, 30, 31—11 days. Cloudy, 2, 3, 4, 5, 7, 8, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 28, 29—20 days.

MARSHALL.

JAN.—Fair, 1, 2, 3, 4, 12, 17, 19, 22, 23, 24, 25, 28, 29—13 days. Cloudy, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 20, 21, 26, 27, 30, 31—18 days.

FEB.—Fair, 5, 6, 7, 10, 14, 19, 20, 21, 23, 25, 27, 28—12 days. Cloudy, 1, 2, 3, 4, 8, 9, 11, 12, 13, 15, 16, 17, 18, 22, 24, 26—16 days.

MARCH.—Fair, 3, 5, 6, 11, 12, 14, 15, 16, 17, 19, 22, 23, 24, 25, 26, 27, 28, 30—18 days. Cloudy, 1, 2, 4, 7, 8, 9, 10, 13, 18, 20, 21, 29, 31—13 days.

APRIL.—Fair, 6, 7, 8, 10, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 26—16 days. Cloudy, 1, 2, 3, 4, 5, 9, 11, 12, 19, 25, 27, 28, 29, 30—14 days.

MAY.—Fair, 1, 3, 4, 5, 6, 7, 9, 10, 12, 14, 17, 19, 20, 24, 28—15 days. Cloudy, 2, 8, 11, 13, 15, 16, 18, 21, 22, 23, 25, 26, 27, 29, 30, 31—16 days.

JUNE.—Fair, 5, 6, 11, 12, 13, 15, 17, 20, 21, 25, 26, 27, 28, 29, 30—15 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 14, 16, 18, 19, 22, 23, 24—15 days.

JULY.—Fair, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31—29 days. Cloudy, 14, 19.

AUG.—Fair, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31—26 days. Cloudy, 9, 13, 14, 15, 26—5 days.

SEPT.—Fair, 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 19, 21, 22, 23, 24, 27, 28—20 days. Cloudy, 5, 15, 16, 17, 18, 20, 25, 26, 29, 30—10 days.

OCT.—Fair, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 23, 28—19 days. Cloudy, 1, 5, 12, 21, 22, 24, 25, 26, 27, 29, 30, 31—12 days.

NOV.—Fair, 3, 4, 6, 15, 16, 25—6 days. Cloudy, 1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30—24 days.

DEC.—Fair, 1, 6, 9, 11, 12, 15, 23, 26, 27, 30, 31—11 days. Cloudy, 2, 3, 4, 5, 7, 8, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 28, 29—20 days.

EXHIBIT 26.—*Dates of Solar and Lunar Halos,*

Line Number.	Stations.	Dates of Halos Recorded.									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Gulliver Lake	.....	14	7, 8, 15	6,7,13, 14, 18	21, 22	22	.....	11	22, 30	*30
2	Manistee	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	Alpena	.....	14	25	7, 13, 14	26	7, 8, 15	6, 11	10, 11	2, 13, 29	.....
4	Grand Haven	.....	.....	.....	.....	.....	11, 14	.....	.....	.....	.....
5	Port Austin	.....	.....	.....	.....	17, 22	15, 16	.....	.....	12, 25	.....
6	Thornville	.....	.....	.....	.....	.....	16	.....	.....	.....	12
7	Lansing, S. B. of H.	.....	12, 13	7	7	11	9, 14	.....	7	6, 10, 20, 24, 25	5, 7, 12, 14
8	Ann Arbor	.....	.....	.....	7	.....	†11	.....	.....	.....	.....
9	Albion	.....	.....	.....	.....	.....	.....	.....	.....	20	13
10	Kalamazoo	.....	.....	*23	14	14	14	.....	.....	7, 9	.....
11	Birmingham	9	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Parhelia.
† Lunar Corona.
Parhelia, Feb. 24; May 12 and 28.—*Lansing.*
Parhelia, January 9.—*Birmingham.*

EXHIBIT 27.—*Inches of Rain and Melted Snow by Year and Months, in 1889, compared with Annual and Monthly Averages for 1888, and for the twelve Years, 1877-88. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Inches of Rain and Melted Snow.											
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877-88*	35.93	2.15	2.63	2.40	2.53	3.35	3.97	3.38	3.33	3.46	3.47	3.10	2.70
1888 (17 stations)	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89
1889 (17 stations)	28.18	2.42	2.04	1.01	1.62	4.21	3.82	3.07	0.98	1.85	1.10	3.10	2.96
In 1889 Greater than Av. for 12 years, 1877-88	.....	.27	.....	.....	.....	.86	.....	.....	.....	.....	.....	.....	.26
In 1889 Less than Av. for 12 years, 1877-88	7.75	.....	.59	1.39	.91	.....	.15	.31	2.35	1.61	2.37	0	.....
In 1889 Greater than in 1888	.....	.43	.27	.....	.....	.48	.95	1.05	.....	.....	.....	.18	1.07
In 1889 Less than in 1888	1.37	.....	.....	1.50	.53	.....	.....	.....	1.40	.81	1.58	.....	.....

* Thornville, Kalamazoo, Detroit for 1877-88; Mendon for 1877-8 and 1880-2; Tecumseh for 1877-8 and 1880-5; Niles for 1878-81; Nirvana, Coldwater, Woodmere Cemetery (near Detroit) for 1877-9; Agricultural College for 1877-8 and 1881-8; Otisville for 1878-80 and 1882; Marquette for 1879-84 and 1886-8; Alpena, Grand Haven; Port Huron for 1879-88; Battle Creek for 1877-8 and 1884; Benton Harbor for 1877-8; Escanaba for 1880-7, Lansing for 1880-8; Washington for 1880-3; Fife Lake, Ypsilanti for 1877; Harrisville for 1881-2 and 1887-8; Reed City for 1881-5; Winfield for 1881-3; Ann Arbor for 1881-2, 1885-6 and 1888; Marshall for 1881-4 and 1886-8; Hudson and Mallory Lake for 1881 and 1886; Traverse City for 1882-8; Hastings for 1882; Hillsdale for 1882-4; Parkville for 1882-3 and 1885-8; Ionia for 1883-4; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Pentwater, East Saginaw for 1886; Birmingham and Gulliver Lake for 1887-8; Hudson for 1888.

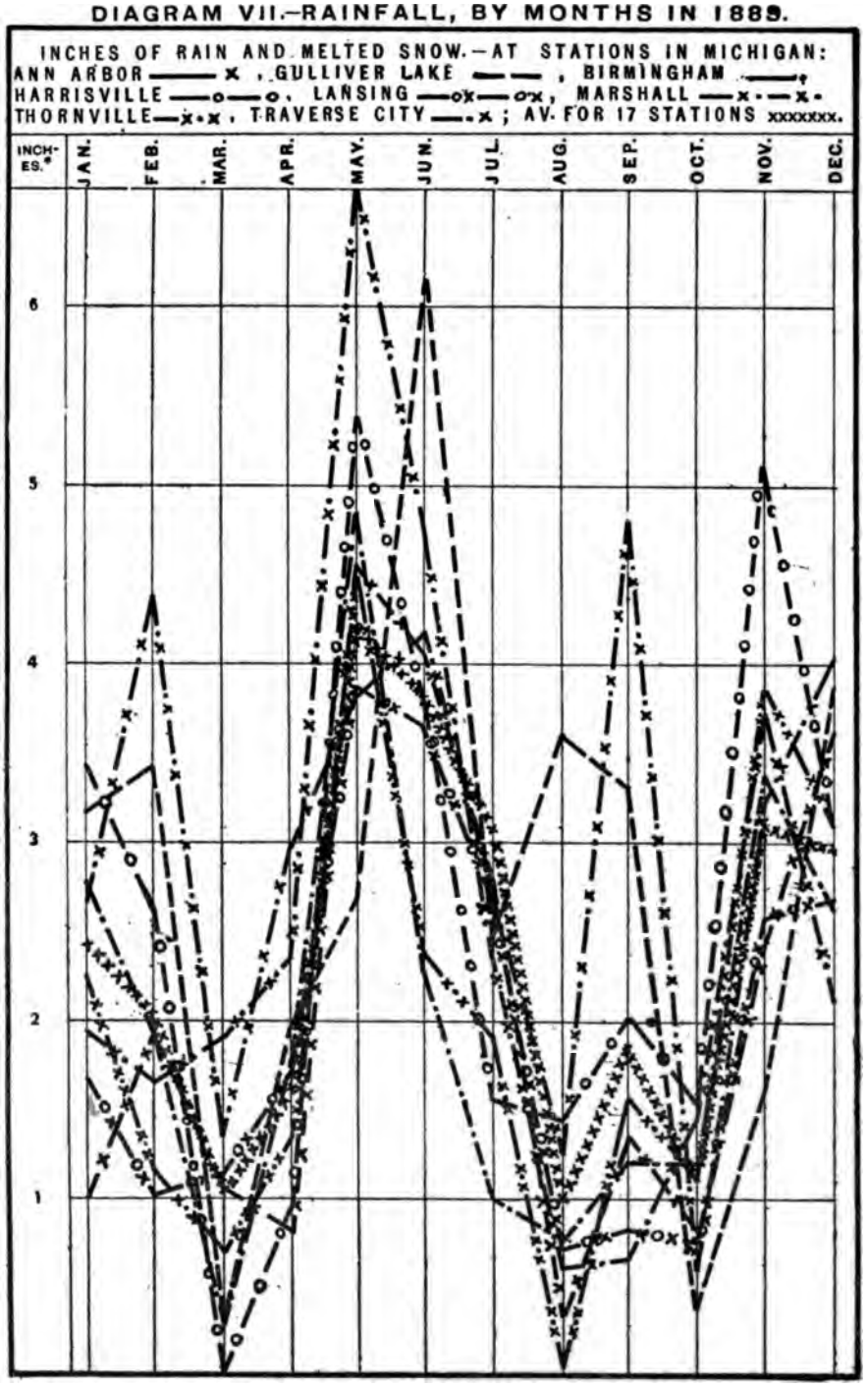
Recorded on the Monthly Registers in 1889.

Months, 1889.														
June.		July.		August.		September.		October.		November.		December.		Line Number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23	1, 9, 16	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31	2
.....	21	.....	.....	.....	.....	.....	.....	.....	.....	7, 10	.....	21, 28	{ 1, 4, 9, 10, 31 }	3
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4, 6, 31	5
.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	9	6
.....	6	13	.....	.....	.....	22	.....	11, 24	4, 10	.....	.....	28	28	7
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
5	6	.....	.....	.....	.....	23	.....	.....	5	.....	.....	.....	9	9
3	6	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	10
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11

EXHIBIT 28.—*Comparison of the Rainfall during the Year and during each month of the Year 1889, with that for the Year 1888, and with the Average for the 25 Years, 1864–88. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 25 years, 1864–88..	32.00	1.86	2.09	2.53	2.36	3.10	4.12	3.34	2.77	3.05	2.60	2.26	1.93
1888.....	26.56	2.18	1.70	1.88	1.15	3.66	2.51	2.40	1.87	1.89	3.00	3.12	1.20
1889.....	24.08	1.53	1.17	1.22	2.02	3.61	3.72	3.41	0.68	0.79	0.65	2.67	2.61
In 1889 **Greater** than Av. for 25 years, 1864–88.....	.....	.....	.....	.....	.....	.51	.....	.07	.....	.....	.....	.41	.68
In 1889 **Less** than Av. for 25 years, 1864–88.	7.92	.33	.92	1.31	.34	.....	.40	.....	2.09	2.26	1.95	.....	.....
In 1889 **Greater** than in 1888.....	.....	.....	.....	.....	.87	.....	1.21	1.01	.....	.....	.....	.....	1.41
In 1889 **Less** than in 1888.....	2.48	.65	.53	.66	.....	.05	.....	.....	1.19	1.10	2.35	.45	.....

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1889.



*SCALE, 1 IN. RAINFALL TO .98 IN. VERTICALLY.

TABLE VII.—*Inches of Rain and Melted Snow for the Year, and for each Month of the Year 1889, at 17 Stations in Michigan,—as compiled from Daily Observations made by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Inches of Rain and Melted Snow.												
		Year.		Months, 1889.										
		Norm. ‡	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 Stations §	.....	.....	28.18	2.42	2.04	1.01	1.62	4.21	3.82	3.07	0.98	1.85	1.10	3.10	2.96
Marquette	U. P.	30.17[4]	30.31	3.94	2.45	1.02	2.63	1.16	3.15	4.80	1.68	3.71	0.78	2.04	2.95
Gulliver Lake	U. P.	37.18[3]	32.92	3.17	3.42	0.31	1.95	2.69	6.17	2.45	3.60	3.31	0.39	1.60	3.86
Manistee	N. W.	.....	29.67	3.05	2.53	0.06	2.04	3.62	4.96	2.42	1.30	3.06	0.45	2.89	3.29
Traverse City	N. W.	39.72[8]	35.99	2.67	4.38	1.35	2.97	3.82	4.18	2.68	1.26	4.81	0.60	3.23	4.04
Alpena	N. E.	36.97[17]	31.32	3.26	2.33	0.21	1.55	3.81	4.61	2.04	2.02	2.84	1.70	4.05	2.90
Harrisville	N. E.	30.49[3]	30.90	3.43	2.62	0.02	0.93	5.38	3.78	1.55	1.44	2.02	1.53	5.11	3.09
Grand Haven	W.	.....	‖	1.61	2.80	0.40	1.75	4.01	4.21	2.23	0.56	.....	0.47	2.34	3.17
Port Huron	B. & E.	32.03[15]	22.22	3.08	1.71	0.77	1.84	3.66	1.86	0.69	0.14	0.46	1.56	3.73	2.72
Thornville	B. & E.	32.88[13]	23.87	2.25	1.17	0.71	1.34	4.48	2.38	1.90	0.04	1.56	1.11	3.84	3.09
Alma	C.	.....	¶	.....	.....	0.70	1.31	3.46	4.68	1.85	0.56	1.13	1.04	1.57	2.83
Agricultural College	C.	31.69[26]	24.08	1.53	1.17	1.22	2.02	3.61	3.72	3.41	0.68	0.79	0.65	2.67	2.61
Lansing, S. B. of H.	C.	34.25[10]	23.28	1.67	1.02	1.14	1.70	3.86	3.65	2.67	0.72	0.83	0.75	2.59	2.68
Albion	S. C.	.....	**	.....	.....	.....	.....	7.05	5.58	1.87	0.40	1.07	1.37	4.99	3.50
Ann Arbor	S. C.	25.64[2]	24.76	1.00	1.93	1.06	0.81	4.56	4.05	2.79	0.34	1.35	0.80	2.46	3.61
Battle Creek	S. C.	.....	††	2.40	2.20	0.97	4.50	.....	.....	2.25	.....	.....	2.37	.....	1.39
Hudson	S. C.	25.84[2]	26.01	1.89	1.71	1.51	0.34	5.24	3.79	4.07	0.46	1.06	1.49	2.21	2.24
Kalamazoo	S. C.	37.27[13]	28.50	1.46	1.35	1.84	1.11	4.86	4.94	4.82	0.31	1.90	1.41	2.20	2.30
Marshall	S. C.	31.26[4]	30.17	1.93	1.66	1.91	2.35	6.68	4.73	2.35	0.61	0.67	1.44	3.72	2.12
Parkville	S. C.	40.05[5]	39.86	2.57	2.49	2.52	1.10	4.88	3.38	10.93	1.15	1.33	1.83	4.55	3.13
Tecumseh	S. C.	.....	‡‡	.....	.....	.....	2.18	5.26	3.24	2.64	0.66	1.52	1.80	.....	.....
Birmingham	S. E.	26.49[3]	24.03	2.78	1.90	0.30	1.77	4.84	2.27	1.00	0.77	1.20	1.20	3.37	2.63
Detroit	S. E.	33.09[18]	21.06	1.51	0.76	1.17	1.14	4.41	3.28	1.54	0.19	0.56	1.05	2.36	3.09

* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 10.

† The names of divisions, and the counties in each, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the rainfall, denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, are given for every month of the year. It does not include Battle Creek, Grand Haven, Alma, Albion and Tecumseh.

‖ The total rainfall for 11 months in 1889 is 23.55 inches. ¶ For 10 months, 19.13 inches. ** For 8 months, 25.83 inches. †† For 7 months, 16.08 inches. ‡‡ For 7 months, 17.30 inches.

NOTE.—The computations of amount of rainfall were furnished by the observers at Detroit, Alpena, Grand Haven, Port Huron, Ann Arbor, Manistee and Marquette for the year. At Albion, May to Dec. All other computations in Table VII. were made in the office of the Secretary of the State Board of Health.

The lines for 8 representative stations in Table VII. are graphically represented in Diagram VII., page 62.

EXHIBIT 29.—*Average Amount of Atmospheric Ozone (Day) by Year and Months, in 1889, compared with Annual and Monthly Averages for 1888, and for the 12 years, 1877–88. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Ozone by Day.—Degree of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877–88*	3.20	3.36	3.49	3.53	3.39	3.34	3.11	2.78	3.00	2.94	2.99	3.11	3.35
1888 (9 stations)	4.20	3.52	3.65	4.03	4.75	5.57	5.06	3.15	3.77	4.40	4.33	4.61	4.57
1889 (8 stations)	3.98	4.31	4.15	3.95	3.91	4.19	4.61	3.80	3.93	3.97	3.54	3.62	3.83
In 1889 **Greater** than Av. for 12 years, 1877–88	.78	.95	.66	.42	.52	.85	1.50	1.02	.93	1.03	.55	.51	.48
In 1889 **Less** than Av. for 12 years, 1877–88													
In 1889 **Greater** than in 1888		.79	.50					.65	.16			.01	
In 1889 **Less** than in 1888	.22			.08	.84	1.38	.45			.43	.79		.74

* Thornville, Kalamazoo for 1877-88; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-4; Niles for 1878-81; Nirvana for 1877-9; Coldwater, Agricultural College for 1877-8 and 1880; Otisville for 1878-80 and 1882; Alpena for 1879-87; Lansing for 1879-88; Washington for 1879-83; Petoskey and Woodmere Cemetery (near Detroit) for 1878-9; Marquette for 1880-1, 1883-4, and 1886-7; Grand Haven for 1880-4; Ann Arbor for 1880-8; Fife Lake, Ypsilanti for 1877; Ionia for 1880 and 1883-4; Adrian for 1880; Hudson and Mallory Lake for 1881; Escanaba for 1881-5 and 1887; Harrisville for 1881-2 and 1885-8; Reed City, Port Huron for 1881-5; Marshall for 1881-8; Traverse City for 1882-8; Hastings and Parkville for 1882; Hillsdale for 1882-4; Port Austin for 1883-5 and 1888; Winfield for 1883; Manistique, Mackinaw City, Swartz Creek for 1884-5; Pentwater for 1886; Birmingham for 1886-8.

† In this exhibit allowance has been made for difference in sensitiveness of test-paper.

EXHIBIT 30.—*Average Amount of Atmospheric Ozone (Night) by Year and Months in 1889, compared with Annual and Monthly Averages for 1888, and for the 12 Years, 1877–1888. These Averages are for Groups of Several Stations in Michigan.**

Years, etc.	Ozone by Night.—Degree of Coloration of Test-paper.*												
	Annual Av	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 years, 1877-88	3.33	3.89	4.05	4.04	3.67	3.49	3.16	2.61	2.63	2.71	3.12	3.36	3.68
1888 (9 stations)	4.29	3.85	3.97	4.27	4.98	5.53	5.09	3.04	3.73	4.07	4.31	3.61	5.05
1889 (8 stations)	4.05	3.89	4.29	4.15	4.30	4.51	5.00	3.97	4.03	3.70	3.29	3.36	4.05
In 1889 **Greater** than Av. for 12 years, 1877–89	.72	0	.24	.11	.63	1.02	1.84	1.36	1.40	.99	.17	0	.37
In 1889 **Less** than Av. for 12 years, 1877–89													
In 1889 **Greater** than in 1888		.04	.32					.93	.30				
In 1889 **Less** than in 1888	.24			.12	.68	1.02	.09			.37	1.02	.25	1.00

* The stations represented in Exhibit 30 are the same as those represented in Exhibit 29, relative to day ozone, and named in foot-note of that exhibit.

† In this Exhibit allowance has been made for the sensitiveness of test-paper.

OBSERVATIONS FOR OZONE AT LANSING.

Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 60, of the Report for 1885, shows that the average for the month of July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M. to 7 A. M. at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying Ozone at Lansing through a long period of years.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during the Year and during each Month of the Year 1889, at 11 Stations, also Average lines for 8 Stations and for 3 Stations in Michigan,—as indicated by Averages of Observations made Daily by exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of of Coloration of the Test-paper (greatest coloration by Ozone equals 10) by observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Day Observations.**												
		Year.		Months, 1889.										
		Norm. ‡	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations§	.....	.....	3.98	4.31	4.15	3.95	3.91	4.19	4.61	3.80	3.93	3.97	3.54	3.62	3.83
Av. for 3 Stations‖	.....	.....	4.00	3.32	3.44	3.22	3.01	3.85	5.18	4.66	5.12	5.22	3.62	2.48	4.94
Marquette	U. P.	.....	¶	.....	7.13	.....	6.02	5.45	4.66	.....	4.77	5.28	....	....	6.09
Manistee	N. W.	.....	4.44	3.13	2.99	3.19	2.69	3.22	7.42	5.79	5.22	6.48	5.14	3.16	a 4.89
Traverse City	N. W.	3.71 11	5.81	5.35	5.20	5.03	5.12	6.29	6.79	6.60	6.51	5.78	5.82	5.53	5.73
Alpena	N. E.	3.54 5	3.95	4.74	4.05	3.77	3.42	3.97	3.82	3.31	4.80	5.72	3.46	2.38	3.93
Harrisville	N. E.	4.36	4.23	4.38	4.13	4.28	3.92	4.22	4.59	4.15	3.86	4.52	4.30	4.13	4.28
Grand Haven	W.	 2	††	4.02 a	3.59 d	4.59	5.09 g	6.62 c	6.09 d	3.89	4.52 c	..... h	2.78 a	2.76	3.62 c
Port Austin	B. & E.	4.10 2	4.01	4.79	4.71	3.99	3.16	3.46	4.85	3.54	3.44	3.68	3.91	4.26	4.37
Port Huron	B. & E.	3.48 13	3.63	2.09	3.27	2.70	2.92	4.35	4.29	4.89	5.35	3.45	2.27	1.93	5.99
Thornville	B. & E.	2.77	3.34	4.42	4.16	4.12	3.32	3.00	3.66 f	2.15	2.22	2.78	2.98	3.43	3.83
Alma	C.	 11	‡‡	.....	.....	3.93	3.36	4.29	4.69	3.50	2.67	3.68	3.63 a	3.76	a 4.55
Lansing, S. B. of H.	C.	3.28	3.53	3.64	3.66	3.57	3.99	3.74 j	4.39 c	4.41	3.88	3.73 b	2.80	1.96	2.54
Albion	S. C.	 10	§§	.....	..... e	 c	.....	4.82 e	4.65	3.60	3.80	3.43	4.33	3.29	3.02 e
Ann Arbor	S. C.	2.95	3.90	4.29	4.44	5.05	4.56	4.51	3.96	3.21	4.02	3.62	3.66	3.06	2.44
Battle Creek	S. C.	.....	‖	2.45	1.88	1.61	1.82	2.29	2.62	1.47	1.54	.....	1.11	0.69	.....
Kalamazoo	S. C.	 9	¶¶	.....	.....	2.96	2.86	3.16	2.76	2.21	2.96	2.78	2.27	1.89	2.25
Marshall	S. C.	3.50 3	3.14	2.67	2.70	2.03	3.26	4.29	4.26	3.34	4.25	3.92	2.46	2.26	2.25
Birmingham	S. E.	3.79	3.91	4.97	4.16	3.54	3.96	4.60	4.39	2.96	3.22	3.72	2.40	4.36	5.22

* At the Stations of the U. S. Signal Service during the year 1889, the observations were made by exposing the test-paper as follows: At Manistee from 8 A. M. to 8 P. M., Jan. to July, and Dec.; from 8 A. M. to 8 P. M., Aug. to Nov. At Grand Haven and Marquette from 8 A. M. to 8 P. M. At Port Huron and Alpena from 8 A. M. to 8 P. M., all 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 31.

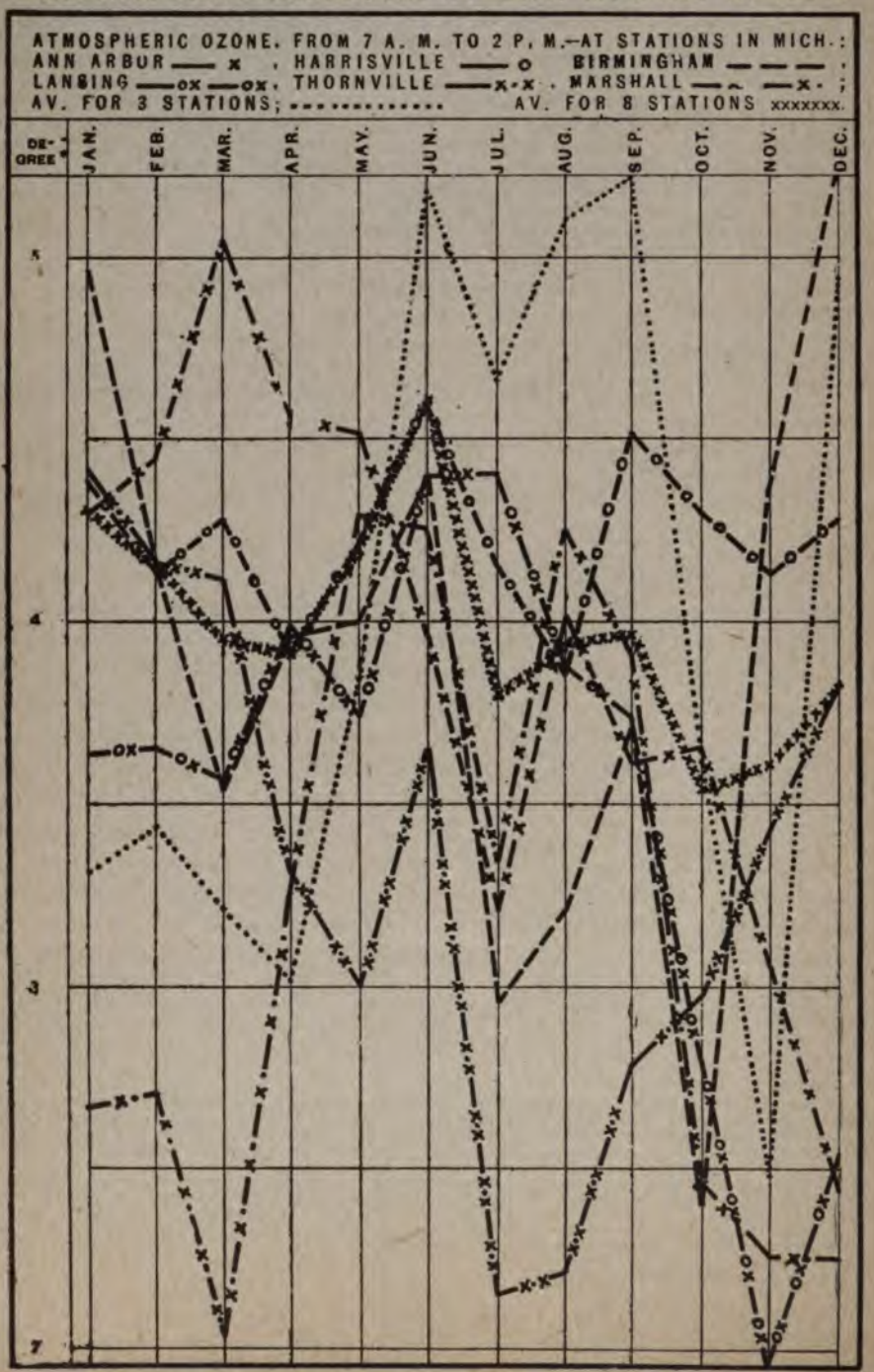
† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10. The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with December 31, 1889. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

[The remaining foot-notes are on page 74.]

Eight lines in this Table are graphically represented in Diagram VIII., page 66.

DIAGRAM VIII.—OZONE, AV. BY DAY, MONTHS IN 1889.



*SCALE, 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS. TO 1.95 IN. VERTICALLY.

TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year and during each Month of the Year 1889, at 11 Stations, also Average lines for 8 Stations and for 3 Stations, in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Degrees of Coloration of Test-paper—Night Observations.**												
		Year.		Months, 1889.										
		Norm.§	1889.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations‖	.....	.....	4.05	3.89	4.29	4.15	4.30	4.51	5.00	3.97	4.03	3.70	3.29	3.36	4.05
Av. for 3 stations¶	.....	.....	4.19	4.34	4.25	4.23	4.53	4.48	5.20	4.32	4.56	4.77	3.70	2.48	3.36
Marquette	U. P.	.....	††	.....	5.54	.....	5.63	3.83	4.67	.....	4.29	4.18	.....	.....	4.44
Manistee	N. W.	.....	5.41	5.73	5.97	6.43	6.56	5.76	6.67	5.77	6.16	5.42	4.79	2.76	2.86
		8			d										
Traverse City	N. W.	3.81	6.03	5.41	6.12	5.67	6.39	6.93	6.77	5.87	6.67	5.45	5.50	5.29	6.25
		11													
Alpena	N. E.	4.26	4.32	4.83	3.76	3.99	3.96	4.22	5.00	4.00	4.03	6.68	4.18	2.88	4.38
		5													
Harrisville	N. E.	5.04	4.51	4.31	4.22	4.25	4.29	4.25	5.40	4.71	4.80	4.58	4.37	3.99	4.93
													b		
Grand Haven	W.	.....	‡‡	3.90	4.27	4.73	4.66	5.26	6.40	4.00	4.19	.....	2.49	2.36	3.39
		3		a	e	a	g	b	c	a	c	g		b	
Port Austin	B. & E.	4.73	4.62	4.23	4.55	4.83	4.00	4.06	6.16	4.67	4.58	4.43	4.34	4.57	4.96
		2													
Port Huron	B. & E.	3.06	2.83	2.47	3.01	2.28	3.06	3.45	3.93	3.19	3.48	2.22	2.14	1.86	2.83
		13													
Thornville	B. & E.	3.33	3.82	4.35	4.76	4.60	4.36	3.77	4.10	3.16	2.90	3.02	3.21	3.23	4.32
									f						a
Alma	C.	.....	§§	.....	.....	3.99	3.53	4.51	4.83	3.64	3.19	3.45	3.27	4.19	4.39
		11													
Lansing, S. B. of H.	C.	3.62	3.41	3.02	4.04	3.41	4.03	3.96	5.10	4.35	3.30	3.23	2.03	2.09	2.32
								h		a			a		
Albion	S. C.	.....	‖‖	.....	.....	.....	.....	4.88	4.60	3.13	3.29	3.45	2.02	2.88	3.19
		10					h	d							d
Ann Arbor	S. C.	2.88	3.32	2.90	3.61	4.64	4.17	4.36	3.90	2.84	3.32	2.92	2.69	2.08	2.48
Battle Creek	S. C.	.....	¶¶	1.83	1.72	1.38	1.78	1.61	2.63	2.03	1.61	.....	0.95	0.56	.....
Kalamazoo	S. C.	.....	A	.....	.....	3.18	2.93	2.96	2.47	2.19	2.74	2.15	1.89	2.13	2.83
		9												b	
Marshall	S. C.	3.11	2.87	2.54	2.90	2.57	3.23	4.93	4.17	2.97	3.38	2.45	1.85	1.53	1.86
		3													
Birmingham	S. E.	3.69	3.81	4.38	4.15	3.25	3.96	3.83	4.40	3.19	3.32	3.52	2.34	4.16	5 25

* At the U. S. Signal Service stations during the year 1889, the observations were made by exposing the test-paper from 8 P. M. to 8 A. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 31.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§ Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of the numbers which state the average, denote the number of years included in the average.

‖ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Battle Creek, Alma, Albion, Kalamazoo and the U. S. Signal Service Stations.

¶ This is an average line for Alpena, Manistee and Port Huron.

** Allowance has been made for difference in sensitiveness of test-paper in this table.

†† The average for 7 months is 4.65. ‡‡ For 11 months, 4.15. §§ For 10 months, 3.90. ‖‖ For 8 months, 3.42. ¶¶ For 10 months, 1.65. A For 10 months, 2.55.

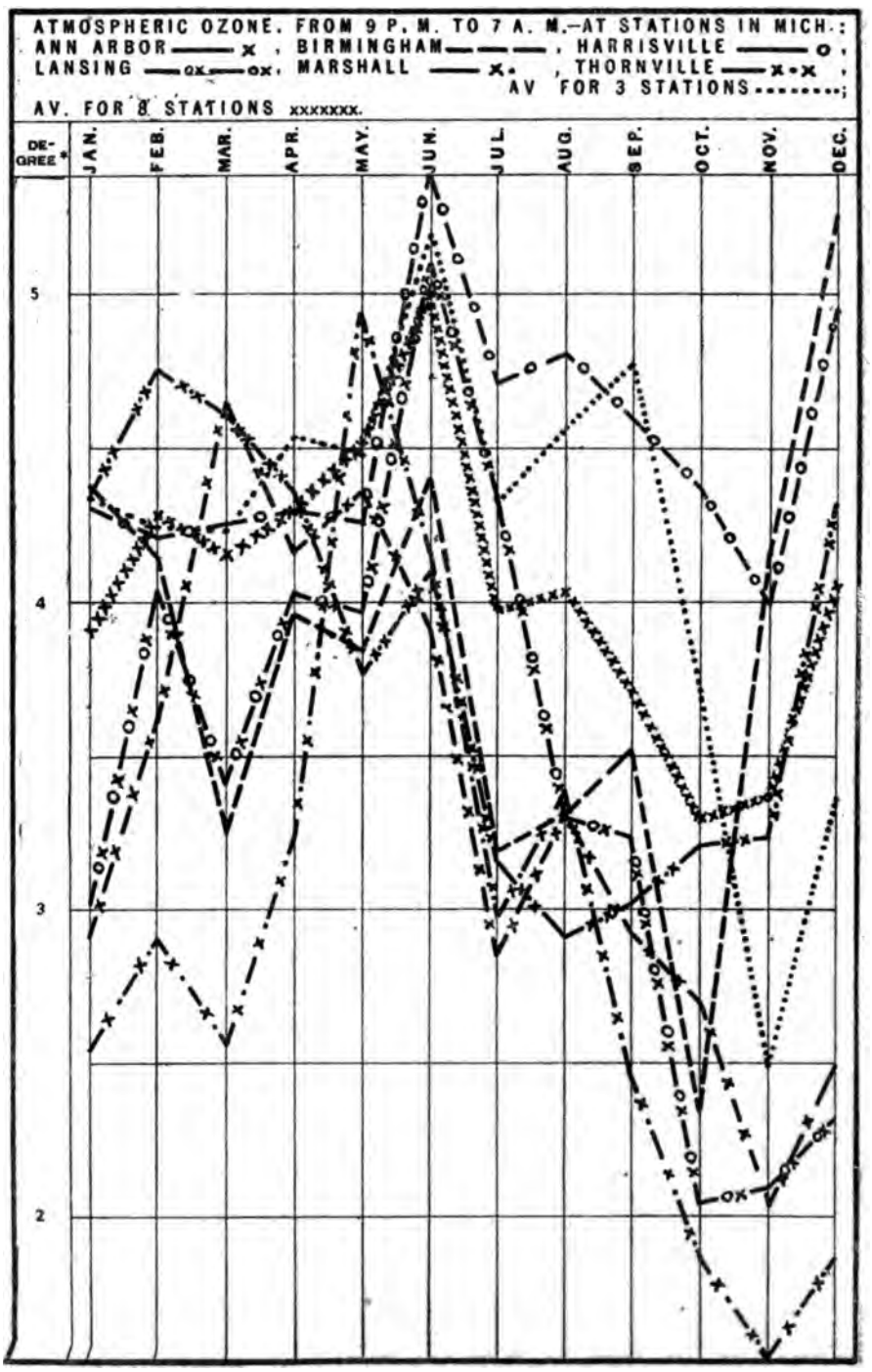
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 24 days. g For 21 days. h For 17 days.

NOTE.—The computations were furnished by the observers at Ann Arbor and Grand Haven for the year; at Manistee, Jan. to May; at Albion, Aug. to Dec. All other computations in Table IX were made at the office of the State Board of Health.

Seven lines in this table are graphically represented in Diagram IX., page 68.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1889.



*SCALE, 1 DEG OF COLORATION (ON SCALE OF 10 DEGS.) TO 1.85 IN. VERTICALLY.

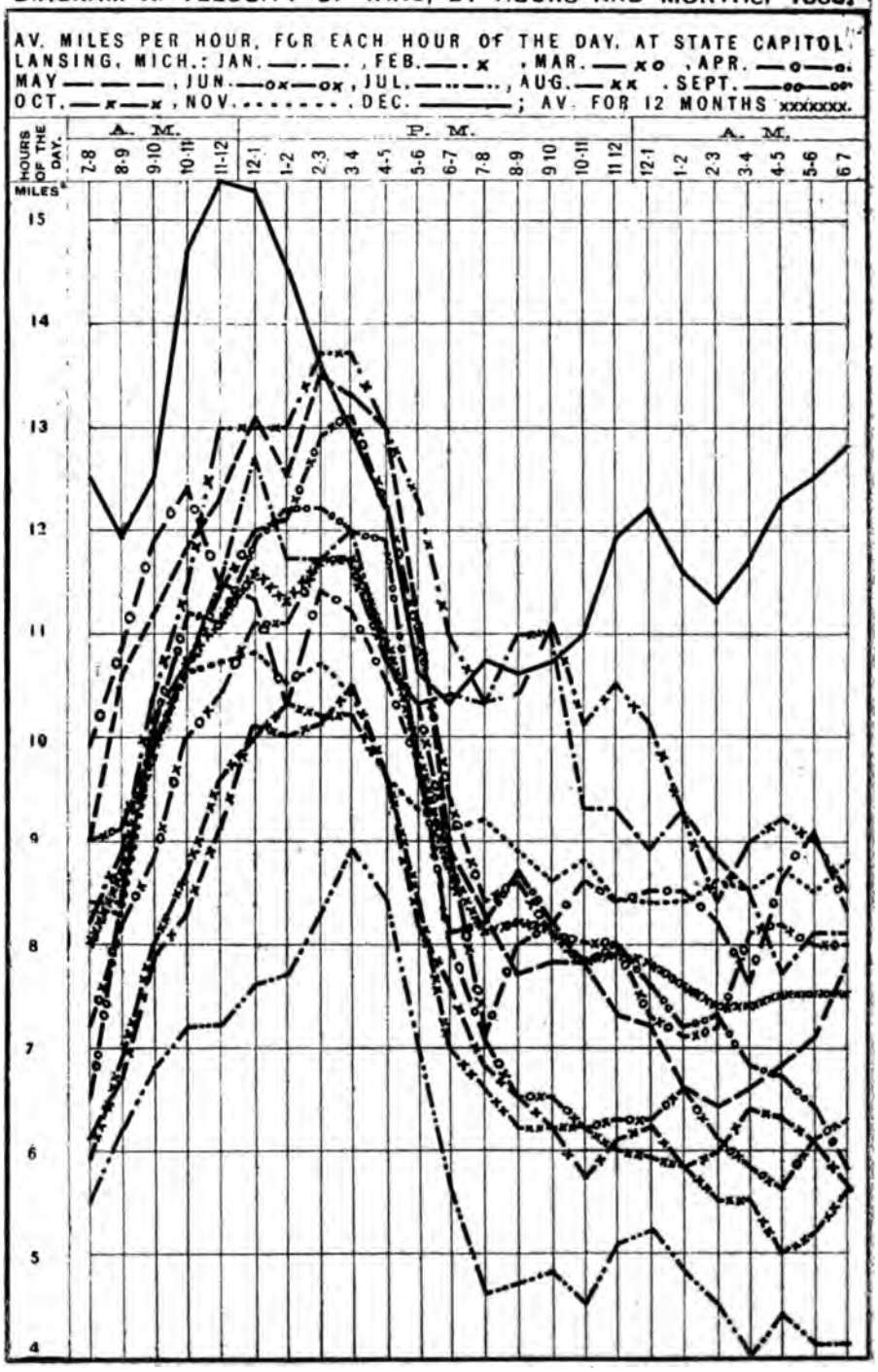
TABLE X.—*Average velocity of the Wind in Miles per Hour, for each Hour of the Day, by Months of the Year 1889. Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.*

Months	Average.			Hours (1889) and Average Miles per Hour.																							
				A. M.					P. M.												A. M.						
	Av. 10 years, 1880-89.	1888.	1889.	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year	9.0	9.8	9.0	8.0	8.7	9.8	10.7	11.1	11.6	11.3	11.7	11.7	10.9	9.8	8.7	8.1	8.2	8.1	7.8	7.9	7.8	7.6	7.4	7.4	7.5	7.5	7.5
January	11.1	9.2	§ 10.0	8.4	8.4	10.2	10.7	11.5	12.7	11.7	11.7	12.0	10.7	10.3	10.4	10.3	11.0	11.0	9.3	9.3	8.9	9.3	8.8	8.5	7.7	8.1	8.1
February	11.4	10.0	10.7	8.2	8.9	10.4	11.5	13.0	13.0	13.0	13.7	13.7	13.0	12.3	11.0	10.3	10.4	11.1	10.1	10.5	10.1	9.3	8.4	9.0	9.2	9.0	8.5
March	11.1	11.7	9.5	9.0	9.1	9.9	10.7	11.4	12.0	12.1	12.9	13.1	12.2	11.0	9.4	8.4	8.6	8.1	8.0	8.0	7.3	7.1	7.2	8.1	8.2	8.0	8.0
April	11.0	10.7	‡ 9.5	9.9	10.9	11.9	12.4	11.5	11.3	10.3	11.4	11.2	10.5	9.7	8.0	7.1	8.0	8.2	8.6	8.4	8.5	8.5	8.2	7.6	8.6	9.1	8.3
May	9.5	9.1	9.5	9.0	10.6	11.2	11.8	12.3	13.1	12.5	13.5	13.3	13.0	11.1	8.9	8.3	7.7	7.8	7.8	7.3	7.2	6.6	6.4	6.6	6.8	7.1	7.8
June	8.5	8.9	† 8.1	7.2	8.2	8.8	10.0	10.4	11.1	11.1	11.7	11.7	10.7	10.3	8.9	7.1	6.5	6.5	6.2	6.3	6.3	6.6	6.1	5.8	5.6	6.1	6.3
July	8.0	7.6	5.9	5.5	6.2	6.8	7.2	7.2	7.6	7.7	8.3	8.9	8.4	7.0	5.6	4.6	4.7	4.8	4.5	5.1	5.2	4.8	4.5	4.0	4.4	4.1	4.1
August	7.4	8.5	* 7.3	5.9	6.9	8.0	8.7	9.6	10.0	10.3	10.2	10.2	9.6	8.4	7.0	6.6	6.2	6.2	6.2	6.0	5.9	5.8	5.5	5.5	5.0	5.2	5.6
September	8.6	9.2	† 8.9	6.5	8.5	10.1	11.2	11.1	11.9	12.2	12.2	12.0	11.9	9.6	8.1	8.2	8.7	8.2	7.8	8.0	7.6	7.2	7.3	6.8	6.7	6.4	5.8
October	8.7	10.2	† 7.4	6.1	6.7	7.9	8.3	9.1	10.1	10.0	10.1	10.5	9.5	8.2	7.6	6.8	6.5	6.2	5.7	6.1	6.2	5.8	6.0	6.4	6.3	6.1	5.6
November	11.0	10.1	‡ 9.3	8.3	8.3	9.9	10.6	10.7	10.8	10.5	10.7	10.4	9.6	9.3	9.1	9.2	8.9	8.6	8.8	8.4	8.4	8.4	8.6	8.5	8.7	8.5	8.8
December	11.2	11.9	‡ 12.3	12.5	11.9	12.5	14.7	15.4	15.3	14.5	13.6	13.0	12.2	10.6	10.3	10.7	10.6	10.7	11.0	11.9	12.2	11.6	11.3	11.7	12.3	12.5	12.8

* For only about 30 days. † For only about 29 days. ‡ For only about 28 days. § For only about 25 days.

The statements in the third figure column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1889, are graphically represented in Diagram XI., page 72. The remaining columns of Table X. for 1889 are graphically represented in Diagram X., page 70.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1889.



*SCALE ONE MILE PER HOUR TO .58 IN. VERTICALLY.

EXHIBIT 31.—*Average Velocity of the Wind in Miles per hour, by Year and Months in 1889, Compared with Annual and Monthly Averages for 1888, and for the 7 years 1882–88. From Registers of the Robinson's Self-Registering Anemometer.* These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Average Miles Per Hour.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years, 1882-88...	9.5	11.1	10.5	10.4	10.2	9.2	8.0	7.8	7.7	8.5	9.6	10.7	10.9
1888 (7 stations).....	9.8	10.2	10.1	11.4	10.6	9.1	8.6	7.3	8.6	8.8	10.1	10.2	12.0
1889 (7 stations).....	9.2	10.2	10.7	9.4	9.5	9.9	7.5	6.9	7.7	9.1	8.8	9.7	11.0
In 1889 Greater than Av. for 7 years, 1882-88.....	.....	.....	.2	.....	.....	.7	.....	.....	.....	.6	.....	.....	.1
In 1889 Less than Av. for 7 years, 1882-88..	.3	.9	.....	1.0	.7	.....	.5	.9	0	.....	.8	1.0	.....
In 1889 Greater than in 1888.....	.....	.....	.6	.....	.....	.8	.....	.....	.....	.3	.....	.....	.....
In 1889 Less than in 1888.....	.6	0	.....	2.0	1.1	.....	1.1	.4	.9	.....	1.3	.5	1.0

* Gibbon's Anemometer was used at Ann Arbor.

TABLE XI.—*Average Velocity of the Wind in Miles per Hour for the Year and for each Month of the Year 1889, at 7 Stations in Michigan. Computed from Registers of the Robinson's Self-Registering Anemometer,* by Observers for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan. †	Division of the State.	Miles, by Self-Registering Anemometer.												
		Year.		Months, in 1889.										
		Norm. ‡	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 Stations.....	.....	.....	9.2	10.2	10.7	9.4	9.5	9.9	7.5	6.9	7.7	9.1	8.8	9.7	11.0
Marquette.....	U. P.	8.8^{4}	8.8	8.6	10.0	8.8	8.7	9.5	7.2	6.9	8.8	10.3	8.6	9.0	8.8
Manistee.....	N. W.	.....	8.3	9.0	10.4	7.6	8.3	9.1	6.3	6.1	7.2	9.2	6.9	9.3	10.5
Alpena.....	N. E.	9.2^{3}	9.2	9.3	10.8	10.0	10.2	10.1	7.9	8.0	7.7	8.4	8.5	9.7	10.8
Grand Haven.....	W.	.....	§	13.1	12.6	10.7	11.8	13.0	9.4	8.1	9.2	.....	6.7	10.4	12.4
Port Huron.....	B. & E.	10.0^{8}	11.0	12.8	11.9	10.7	10.6	12.1	7.8	8.7	9.7	10.8	12.1	11.2	13.2
Lansing, S. B. of H....	C.	9.8^{10}	9.0	10.1	10.7	9.5	9.5	9.5	8.1	5.9	7.2	8.9	7.1	9.2	12.2
Ann Arbor.....	S. C.	9.0^{8}	8.6	10.4	10.1	9.6	9.4	8.8	6.8	5.4	6.0	7.4	8.6	9.3	10.8
Detroit.....	S. E.	9.4^{8}	9.5	10.9	10.9	9.8	9.5	10.3	8.4	7.2	7.6	8.9	10.0	10.0	10.9

* Gibbon's Anemometer was used at Ann Arbor.

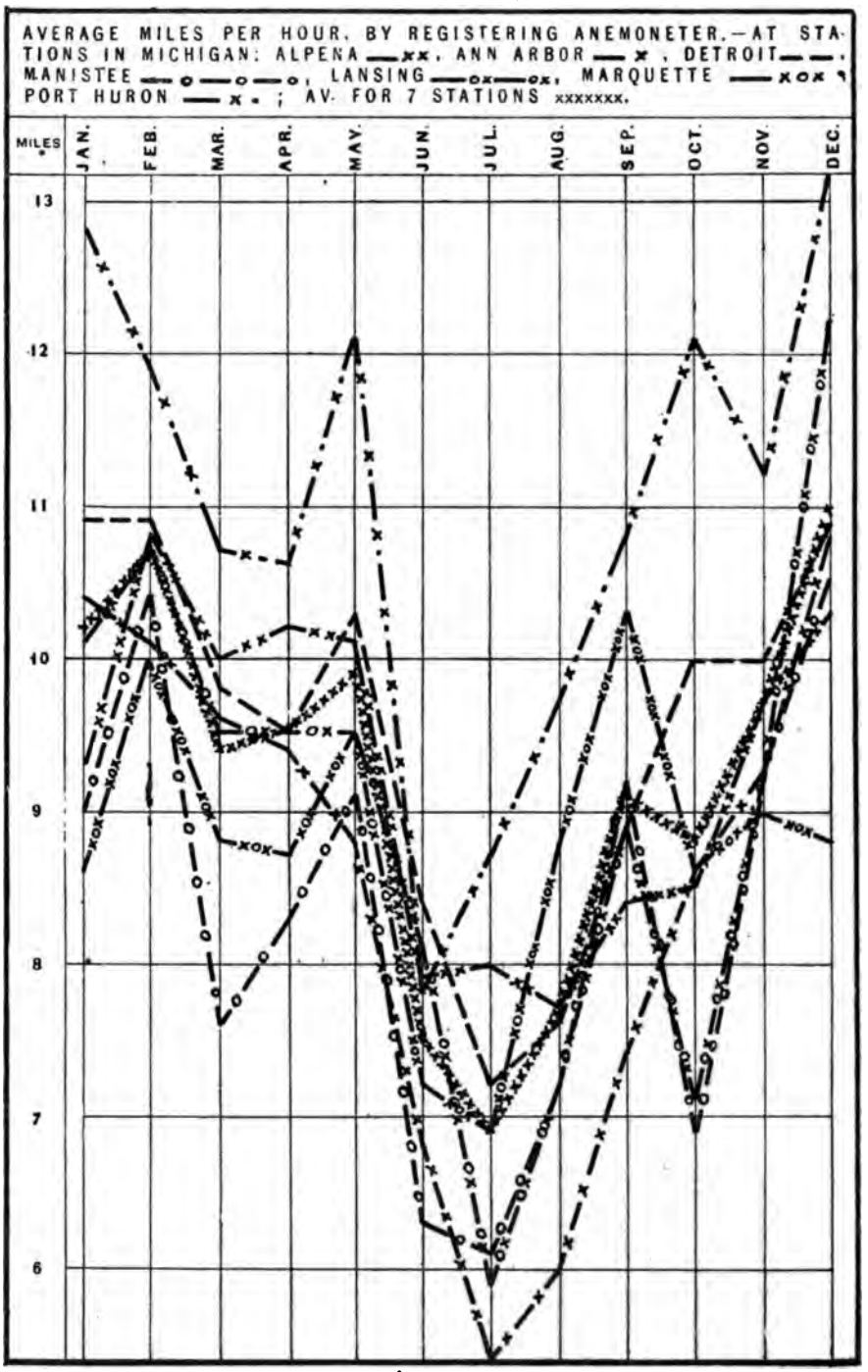
† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10.

‡ Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

§ The average for 11 months in 1889 is 10.7.

Graphic representations of statements made in Table XI., are given in Diagram XI., page 72.

DIAGRAM XI.—VELOCITY OF WIND, BY MONTHS IN 1889.



"SCALE, ONE MILE PER HOUR TO .82 IN. VERTICALLY."

EXHIBIT 32.—*Average Velocity of the Wind in Miles per Hour, by Months for the 9 Years, 1880–88, and comparisons of 1889 with this Average and with the Year 1888. From Registers of the Robinson's Self-Registering Anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.*

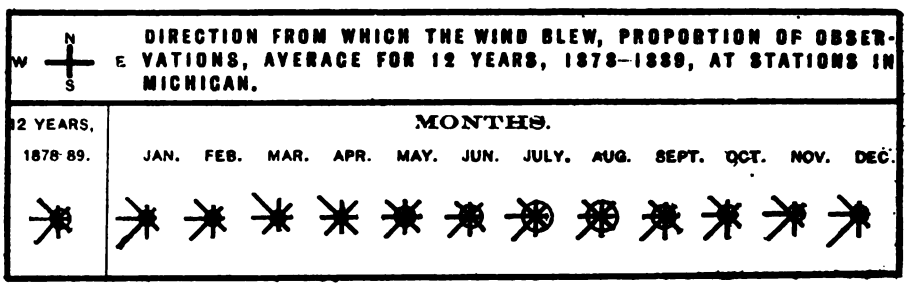
Years, etc.	Miles, by Self-Registering Anemometer.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 years, 1880-88..	9.9	11.2	11.5	11.3	11.3	9.5	8.6	8.2	7.4	8.6	8.9	11.2	11.1
1888.....	9.8	9.2	10.0	11.7	10.7	9.1	8.9	7.6	8.5	9.2	10.2	10.1	11.9
1889.....	9.0	10.0	10.7	9.5	9.5	9.5	8.1	5.9	7.3	8.9	7.4	9.3	12.3
In 1889 **Greater** than Av. for 9 years, 1880-88....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.3	.....	.....	1.2
In 1889 **Less** than Av. for 9 years, 1880-88.....	.9	1.2	.8	1.8	1.8	0	.5	2.3	.1	.....	1.5	1.9	.....
In 1889 **Greater** than in 1888.....	.....	.8	.7	.....	.....	.4	.....	.....	.....	.....	.....	.....	.4
In 1889 **Less** than in 1888.....	.8	.....	.....	2.2	1.2	.....	.8	1.7	1.2	.3	2.8	.8	.....

EXHIBIT 33.—DIRECTION OF WIND, 1878–89.—*Number of Observations per Month (made tri-daily), at which the Wind was blowing from the several (eight) points of Compass.—Annual and Monthly Averages for the 12 Years 1878–89, at Stations in Michigan.**

Points of Compass.	Average Number of Observations per Month—12 Years, 1878-89.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
All observations...	91	93	85	93	90	93	90	93	93	89	92	90	93
Calm.....	5	4	4	4	4	5	6	8	8	6	5	4	4
North.....	7	6	6	10	9	8	7	8	8	6	8	6	6
Northeast.....	8	6	7	10	11	11	9	8	10	7	8	7	5
East.....	6	5	6	7	8	8	6	5	6	6	5	5	5
Southeast.....	9	9	9	9	11	11	10	8	9	11	9	7	8
South.....	10	11	10	7	8	10	11	10	10	12	12	11	11
Southwest.....	17	22	16	12	12	15	16	18	17	18	18	19	23
West.....	14	16	14	14	11	12	13	16	12	12	13	17	17
Northwest.....	14	15	13	19	16	13	11	13	13	12	14	15	14

* At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885; 16 in 1886; 17 in 1887; 13 in 1888, and 11 in 1889.

DIAGRAM XIII.--WIND, DIRECTION, IN MICH., AVERAGE 12 YEARS, 1878–1889.



* SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION

TABLE XII.--*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,* Daily), at which the wind was blowing from each of the Eight Principal Points of Compass, during the Year and during each Month of the Year 1889. Average for 11 Stations in Michigan.†*

Points of Compass.	Average Number of Observations per Month, 1889.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations (11 stations)	91	93	85	93	90	93	90	93	93	89	92	90	93
Calm	6	5	4	4	4	5	5	9	11	7	5	6	6
North	9	5	5	12	9	10	6	10	8	5	19	9	5
Northeast	9	8	4	11	10	11	8	8	6	5	14	12	6
East	5	5	7	4	5	6	7	6	3	6	5	6	4
Southeast	9	10	7	11	10	8	10	10	9	14	6	6	11
South	9	9	9	5	9	11	7	10	9	12	5	7	11
Southwest	18	23	17	10	13	16	23	19	21	17	8	19	24
West	13	15	14	15	14	10	12	11	12	11	13	13	14
Northwest	14	12	17	20	14	15	10	10	11	12	17	14	11

* At stations of the U. S. Signal Service the observations during the year 1889 were made at 8 A. M. and 8 P. M., 75th meridian time, and are not used in this table.

† The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1, page 10.

[Foot-notes to Table VIII., page 65.]

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Alma, Albion, Kalamazoo, Battle Creek, and the Signal Service Stations.

‖ This is an average line for Manistee, Alpena and Port Huron.

¶ The average for 7 months in 1889 is 5.63. †† For 11 months, 4.32. ‡‡ For 10 months, 3.81. §§ For 8 months, 3.87. ‖‖ For 10 months, 1.75. ¶¶ For 10 months, 2.61.

** Allowance has been made for difference in sensitiveness of test-paper in this table.

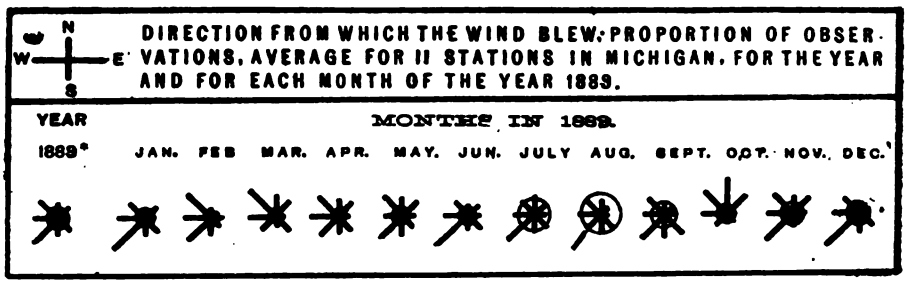
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days. h For 19 days. i For 18 days. j For 16 days.

NOTE—The computations were furnished by the observers at Ann Arbor and Grand Haven for the year; at Manistee, Jan. to May; at Albion, May to Dec. All other computations for Table VIII. were made in the office of the State Board of Health.

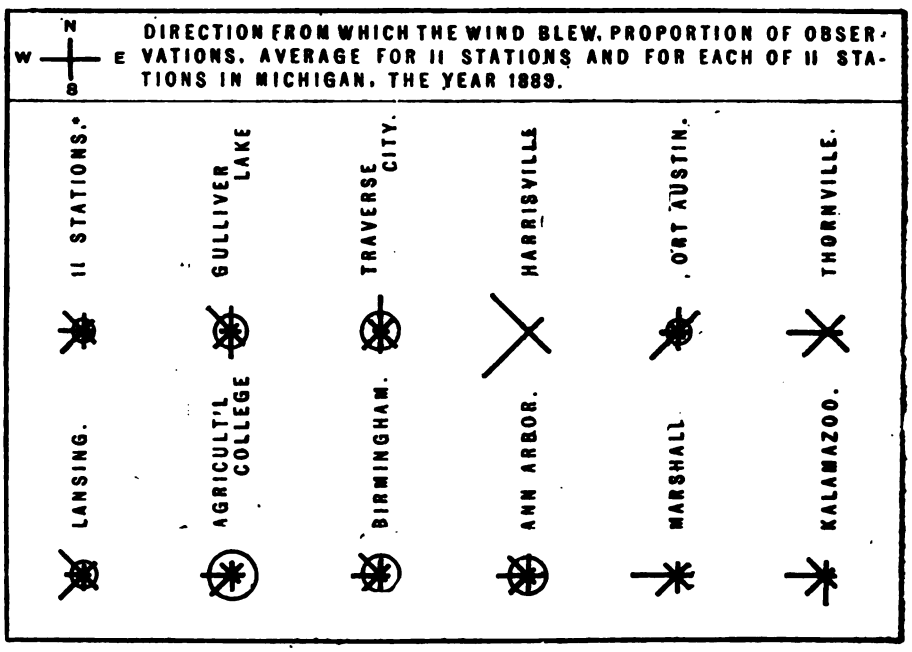
Graphic representations of statements in Table XII. are given in Diagram XIV., page 75.

DIAGRAM XIV.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1889.



*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION.

DIAGRAM XV. WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1889.



*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION. NUMERICAL STATEMENTS CORRESPONDING TO LINES IN THIS DIAGRAM ARE GIVEN IN TABLE XIII., PAGE 76.

The construction and purport of the diagrams relating to direction of wind may be explained as follows:

In Diagrams XII., XIII., XIV. and XV., pages 77, 74, and 75, relating to the direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M., 2 P. M. and 9 P. M. daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from

the upper left-hand corner, that it was from the northwest; from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; and from the lower left-hand corner, that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the *radius* of the circle drawn about the point of convergence of the lines for a given place or period of time, the length of one observation being, as before, .01 of an inch. Thus, by Diagram XII., page 77, or by Table XIV., pages 78-81, it appears that at Thornville in February, 1889, at one of the regular tri-daily observations for the month there was a calm; at 39 observations the wind was blowing from the west, at 14 observations from the northwest; at 3 from the northeast, etc. For convenient study the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII. and XIV., and Exhibit 33, pages 74, 76, 78-81, 73.

TABLE XIII.—*Average Number of Observations per Month for the Year 1889, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 16 Stations* in Michigan; also the Average lines for 11 Stations, and for 5 Stations.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Average Number of Observations Per Month in 1889.									
		All Obs.	Calms	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 11 stations		90	6	9	8	5	9	9	17	13	14
Av. for 5 stations §		61	1	7	5	5	6	9	9	9	10
Marquette	U. P.	61	2	8	3	3	5	8	7	9	17
Gulliver Lake	U. P.	91	9	14	5	5	10	14	13	6	17
Manistee	N. W.	61	1	9	4	7	5	14	9	7	6
Traverse City	N. W.	91	10	19	9	4	12	12	13	4	8
Alpena	N. E.	61	1	4	4	5	10	5	7	13	12
Harrisville	N. E.	91	0	1	10	0	16	2	34	1	27
Port Austin	B. & E.	88	6	12	14	6	5	10	21	9	6
Port Huron	B. & E.	61	0	8	8	4	6	12	9	7	7
Thornville	B. & E.	91	1	2	11	7	15	2	18	22	16
Agricultural College	C.	91	13	7	8	7	6	9	16	17	8
Lansing, S. B. of H.	C.	92	7	5	9	4	11	8	19	10	18
Ann Arbor	S. C.	91	10	11	5	8	6	8	13	16	14
Kalamazoo	S. C.	91	1	8	6	6	8	15	14	21	13
Marshall	S. C.	91	0	7	9	8	9	9	17	24	9
Birmingham	S. E.	87	10	8	7	5	5	8	14	15	14
Detroit	S. E.	61	1	4	8	4	5	7	13	8	10

* At the Stations of the U. S. Signal Service the observations during the year 1889 were made at 8 A. M. and 8 P. M., 75th meridian time.

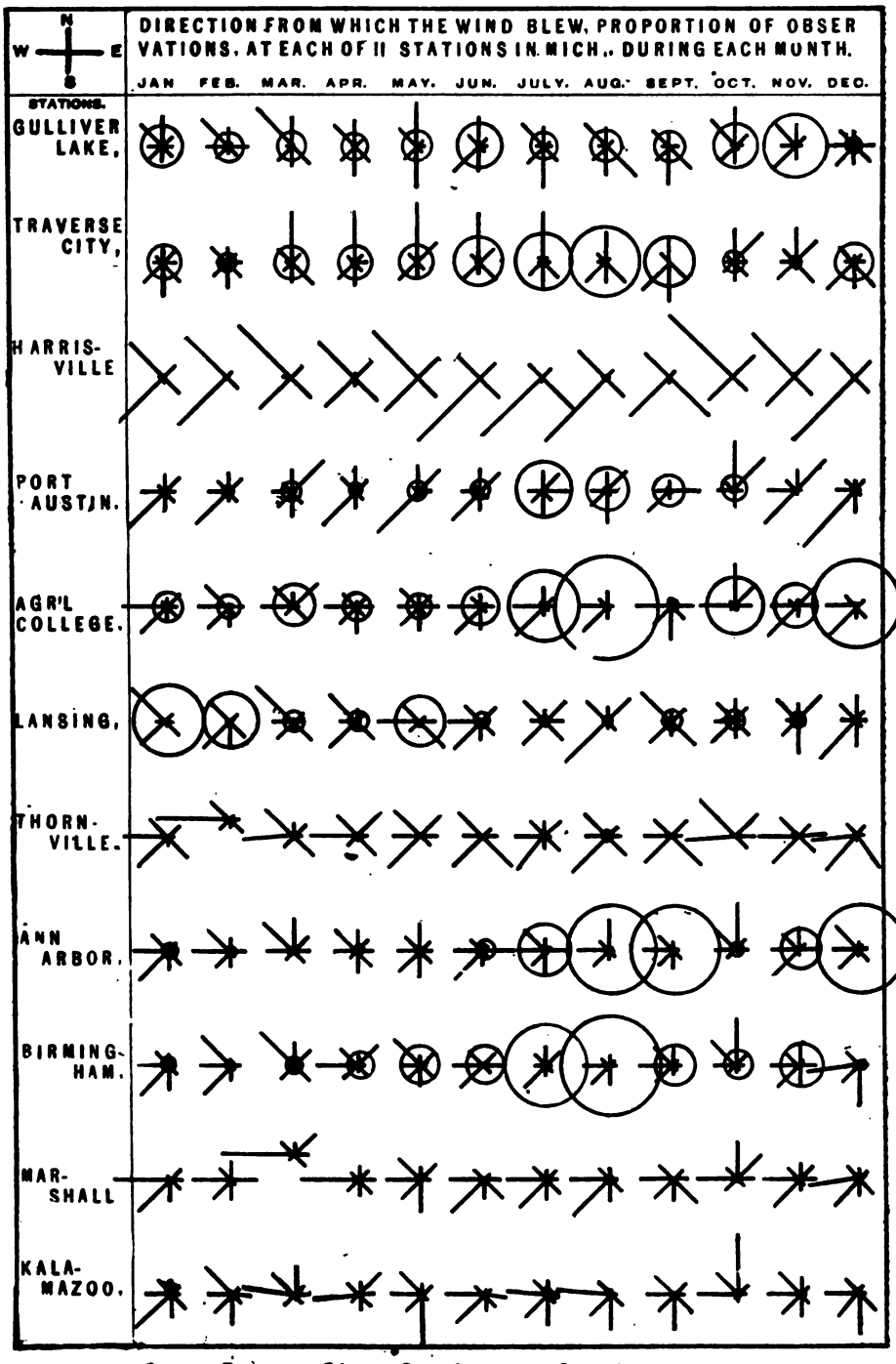
† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10.

‡ The full names of the divisions, and the counties in each division, are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§ This is an average line for the 5 U. S. Signal Service Stations only.

Graphic representations of statements in Table XIII. are given in Diagram XV., page 75.

DIAGRAM XII.—WIND, DIRECTION, AT STATIONS, BY MONTHS, 1889.



SCALE RADIUS .01 OF ONE INCH TO ONE OBSERVATION.

TABLE XIV.—*Number of Observations for each Month of the Year 1889, at which the wind was Blowing from each of the eight Principal Points of the Compass, at each of the 16 Stations* in Michigan; also the Average Lines for 11, and for 5 of the said Stations from which nearly Complete Observations were received for the Year. (Observations were made at 7 A. M., 2 P. M., and 9 P. M., Daily.)†*

Stations in Michigan. (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	January.										February.										March.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 11 Stations‡	.....	93	5	5	8	5	10	9	23	15	12	84	4	5	4	7	7	9	17	14	17	93	4	12	11	4	11	5	10	15	20
Av. for 5 Stations§	.....	62	0	4	6	4	5	9	11	14	8	56	0	4	3	4	4	8	8	13	11	62	1	13	5	4	5	5	4	9	17
Marquette	U. P.	62	0	5	2	3	2	8	5	17	20	56	0	5	1	0	7	5	7	14	17	62	0	7	4	0	4	4	1	10	32
Gulliver Lake	U. P.	93	11	16	7	5	8	9	12	9	16	84	8	10	3	12	7	4	9	11	20	93	8	16	2	0	13	11	11	4	28
Manistee	N. W.	62	0	3	14	3	6	13	7	12	4	56	0	6	5	9	3	7	9	9	8	62	1	19	2	7	3	10	5	5	10
Traverse City	N. W.	93	9	9	9	7	14	18	15	6	6	84	5	9	7	8	11	14	11	6	13	93	9	29	6	1	16	11	7	3	11
Alpena	N. E.	62	1	6	4	2	7	7	9	21	5	56	0	2	3	4	4	5	8	16	14	62	4	6	2	7	8	1	3	14	17
Harrisville	N. E.	93	0	0	9	1	12	3	39	3	26	84	0	0	4	0	8	1	38	2	31	93	0	1	8	0	15	0	24	5	40
Grand Haven	W.	62	0	7	5	10	7	6	11	8	8	56	0	5	9	12	3	4	4	12	7	62	0	10	13	9	3	5	8	4	10
Port Austin	B. & E.	93	2	10	11	6	7	10	29	13	5	84	3	10	10	4	7	6	25	11	8	93	5	12	24	3	8	13	11	11	6
Port Huron	B. & E.	62	0	3	6	7	5	12	15	9	5	56	1	3	0	3	5	11	10	13	10	62	0	20	5	1	9	6	5	6	10
Thornville	B. & E.	93	1	0	9	3	15	5	22	24	14	84	1	0	3	6	10	4	7	39	14	93	0	7	11	4	15	1	7	27	21
Alma	C.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	93	13	25	14	3	4	4	13	8	9
Agr'l College	C.	93	8	5	10	6	8	8	20	24	4	84	7	2	2	8	5	11	16	16	17	93	11	8	19	3	10	2	7	18	15
Lansing, S. B. of H.	C.	93	19	0	5	4	10	2	19	7	27	87	15	0	6	2	12	14	20	3	15	93	6	2	7	6	14	5	13	12	28
Otsego	S. W.	93	0	0	0	9	14	22	16	29	3	75	2	6	0	4	13	13	2	25	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Albion	S. C.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ann Arbor	S. C.	93	4	4	6	5	10	10	22	19	13	84	3	7	2	9	4	9	13	21	16	93	0	18	11	9	8	2	6	16	23
Battle Creek	S. C.	93	0	6	3	4	9	25	31	8	7	84	18	6	1	6	0	22	16	5	10	93	41	13	5	1	7	2	2	5	17
Kalamazoo	S. C.	93	0	7	6	5	11	13	27	14	10	84	0	1	5	10	6	16	13	13	20	93	1	16	6	7	6	3	8	29	17
Marshall	S. C.	93	0	1	9	7	7	11	24	31	3	84	0	10	0	15	4	11	14	21	9	93	0	7	17	8	8	0	4	39	10
Birmingham	S. E.	91	6	6	5	4	7	13	23	17	10	83	2	4	1	6	3	8	21	16	22	91	5	13	13	5	12	2	11	5	25
Detroit	S. E.	62	0	5	4	4	5	6	20	11	7	56	0	6	4	5	2	10	7	15	7	62	0	11	11	6	2	2	6	10	14

Diagram XII., page 77, gives 11 lines in this table, and is explained on pages 75 and 76. *For names of observers, etc., see Exhibit 1, page 10. For names of divisions, etc., see Exhibit I. in a paper which follows on weekly reports of sickness. † With exceptions stated for U. S. Signal Service Stations in Table I., page 31. ‡ This line includes only the 11 stations, at which observations were made tri-daily, and from which statements complete, or nearly complete, were received for every month of the year; it does not include Alma, Otsego, Albion and the U. S. Signal Service Stations. § This is an average line for the 5 U. S. Signal Service Stations; it does not include Grand Haven.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1889.—Observations at which the Wind was blowing from Direction named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	April.										May.										June.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 11 Stations†	.....	89	4	9	10	5	10	9	13	14	14	92	5	10	11	6	8	11	16	10	15	89	5	6	8	7	10	7	23	12	10
Av. for 5 Stations §	.....	60	1	8	6	4	7	11	5	5	13	62	1	8	8	4	6	12	6	4	12	60	3	5	6	5	7	10	10	6	8
Marquette	U. P.	60	2	6	3	4	2	12	6	4	21	62	2	13	4	5	4	12	5	3	14	60	6	8	1	8	1	9	6	3	18
Gulliver Lake	U. P.	90	9	15	7	2	12	16	11	2	16	93	8	24	5	5	5	22	10	0	14	90	12	16	6	5	6	14	20	2	9
Manistee	N. W.	60	1	9	2	5	7	19	4	4	9	62	0	10	3	3	2	18	6	4	16	60	6	4	3	5	4	13	15	6	4
Traverse City	N. W.	90	9	28	6	7	6	13	13	2	6	93	9	32	15	1	5	9	14	1	7	90	13	27	11	0	13	6	11	2	7
Alpena	N. E.	60	2	6	4	2	15	3	4	9	15	62	1	3	11	6	15	4	2	5	15	60	3	2	5	3	18	2	6	10	11
Harrisville	N. E.	90	0	3	12	0	18	5	23	2	27	93	0	0	15	0	15	2	26	1	34	90	0	0	11	0	15	0	48	0	16
Grand Haven	W.	60	0	5	3	10	6	11	7	7	11	62	0	9	7	5	5	14	7	5	10	60	0	4	5	5	6	19	7	6	8
Port Austin	B. & E.	83	4	14	10	1	6	10	24	3	11	89	5	14	16	7	4	5	32	2	4	90	5	12	14	2	6	11	23	11	6
Port Huron	B. & E.	60	0	14	11	3	5	13	4	3	7	62	0	13	10	2	4	17	5	6	5	60	0	10	9	0	9	16	10	5	1
Thornville	B. & E.	90	0	0	18	5	14	3	8	26	16	93	0	1	16	10	8	0	24	15	19	90	0	0	6	8	23	0	23	11	19
Alma	C.	90	15	15	9	4	3	7	12	15	10	93	17	18	6	2	2	3	25	11	9	90	18	4	14	2	1	4	20	21	6
Agr'l College	C.	90	8	4	8	9	5	14	13	18	11	93	7	8	9	11	7	13	12	12	14	90	10	6	4	7	4	13	21	18	7
Lansing, S. B. of H.	C.	90	6	7	5	2	13	5	21	10	21	93	13	0	4	9	20	3	8	23	13	90	4	2	11	3	10	10	21	17	12
Otsego	S. W.	90	4	6	1	12	5	15	5	39	3	93	3	8	3	8	1	22	6	36	6	90	18	0	0	5	15	13	11	24	4
Albion	S. C.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	54	4	4	7	1	6	11	6	9	6	90	11	0	6	8	13	9	20	16	7
Ann Arbor	S. C.	90	3	12	9	9	11	11	5	13	17	93	1	15	8	7	9	14	16	12	11	90	5	3	4	17	6	8	22	16	9
Battle Creek	S. C.	90	22	4	4	5	1	4	11	17	22	93	0	9	10	2	6	19	8	22	17	90	18	2	7	5	7	15	4	25	7
Kalamazoo	S. C.	90	1	6	15	7	9	10	7	26	9	93	0	6	7	3	4	27	12	17	17	90	1	3	4	12	10	10	22	21	7
Marshall	S. C.	90	0	8	7	9	10	9	9	32	6	93	0	7	12	6	1	17	15	19	16	90	0	0	5	9	14	10	25	19	8
Birmingham	S. E.	87	7	6	15	4	7	3	10	22	13	90	10	6	10	4	9	11	10	10	20	82	10	1	9	11	6	0	18	16	11
Detroit	S. E.	60	0	6	9	5	4	6	9	6	15	62	1	3	12	3	6	7	14	4	12	60	0	1	11	8	4	10	15	4	7

*†§ For these references see foot-notes to this table on page 78.

NOTE.—Graphic representations of statements for 11 lines in this table are given in Diagram XII., page 77, which is explained on pages 75 and 76.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1889.—Observations at which the Wind was blowing from Directions named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	July.										August.										September.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 11 Stations†	.....	92	9	10	8	6	10	10	19	11	10	92	11	8	6	3	9	9	21	12	11	87	7	5	5	6	14	12	17	11	12
Av. for 5 Stations§	.....	62	2	6	5	5	8	12	8	6	8	62	2	5	4	4	7	15	12	8	8	60	2	3	3	4	10	12	9	9	7
Marquette	U. P.	62	5	10	0	5	7	12	4	5	14	62	2	6	3	3	7	5	13	10	13	60	3	7	1	0	6	10	13	6	14
Gulliver Lake	U. P.	93	7	11	4	4	11	23	13	3	17	93	8	10	5	0	21	16	11	5	17	90	8	8	1	5	17	22	11	5	13
Manistee	N. W.	62	3	3	2	5	9	19	10	6	5	62	1	9	0	6	6	21	15	3	1	60	0	3	1	8	6	20	8	9	5
Traverse City	N. W.	93	15	28	4	4	12	14	10	2	4	93	19	17	4	2	15	11	15	4	6	90	13	13	0	0	13	22	21	1	7
Alpena	N. E.	62	0	5	1	6	18	4	7	12	9	62	1	2	1	7	12	6	7	14	12	60	2	2	1	5	14	10	10	11	5
Harrisville	N. E.	93	0	0	7	1	24	3	47	1	10	93	0	0	7	2	14	0	48	2	20	90	0	1	5	0	30	4	32	0	18
Grand Haven	W.	62	1	10	0	6	8	15	7	5	10	62	0	8	3	7	8	16	10	6	4	...	...	...	...	...	...	...	...	...	...
Port Austin	B. & E.	92	16	11	13	14	7	14	9	8	0	87	12	11	16	6	2	18	11	9	2	65	9	6	1	16	2	5	16	7	3
Port Huron	B. & E.	62	0	11	13	4	3	12	10	2	7	62	2	6	9	2	6	13	12	8	4	60	1	2	8	3	10	15	6	11	4
Thornville	B. & E.	93	1	8	12	3	11	7	24	16	11	93	3	0	9	7	14	2	28	13	17	90	0	1	11	6	22	0	22	15	13
Alma	C.	93	8	2	11	2	3	4	27	23	13	91	24	4	4	0	3	1	25	25	5	90	21	0	1	7	14	2	7	23	15
Agr'l College	C.	93	19	11	6	5	4	6	23	17	2	93	28	9	1	4	3	7	18	16	7	89	4	5	3	13	10	18	14	19	3
Lansing, S. B. of H.	C.	93	3	6	15	10	14	3	18	8	16	93	3	8	17	2	7	4	33	3	16	90	5	4	10	1	18	8	17	4	23
Otsego	S. W.	91	21	0	1	8	3	21	6	29	2	93	13	0	0	0	7	25	7	40	1	85	5	0	1	1	12	31	6	22	7
Albion	S. C.	93	20	3	7	8	9	7	19	5	15	93	15	6	5	5	5	3	33	8	13	89	12	1	2	9	19	9	17	13	7
Ann Arbor	S. C.	93	14	7	3	11	3	13	11	15	16	93	24	17	2	3	4	5	13	17	8	90	24	5	2	4	7	10	11	16	11
Battle Creek	S. C.	.....	.....	...	...	...	...	...	...	...	...	93	1	4	2	0	6	16	26	22	16	90	0	6	7	5	15	14	22	14	7
Kalamazoo	S. C.	93	2	8	3	7	6	16	17	23	11	93	1	3	2	3	9	19	16	29	11	90	0	1	9	6	12	20	13	15	14
Marshall	S. C.	93	0	6	8	6	10	10	21	22	10	93	0	7	2	4	9	12	28	22	9	90	0	1	7	8	18	12	15	18	11
Birmingham	S. E.	88	22	10	10	3	5	6	17	7	8	85	27	6	3	4	1	10	14	14	6	81	11	9	3	3	4	6	13	18	14
Detroit	S. E.	62	2	3	11	7	5	11	10	6	7	62	2	3	8	1	4	15	13	7	9	60	4	3	6	3	13	6	9	8	8

*, †, § For these references see foot-notes to this table on page 78.

NOTE.—Graphic representations of statements for 11 lines in this table are given in Diagram XII., page 77, which is explained on pages 75 and 76.

TABLE XIV.—CONCLUDED.—*Direction of Wind, Months in 1889.—Observations at which the Wind was blowing from Directions named*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 11 Stations‡	.....	92	5	19	14	5	6	5	8	13	1	90	6	9	12	6	6	7	19	13	14	93	6	5	6	4	11	11	24	14	11
Av. for 5 Stations§	.....	62	0	9	10	5	5	6	6	6	15	60	1	7	7	5	2	5	14	11	8	62	1	3	4	7	7	10	11	14	5
Marquette	U. P.	62	0	11	8	2	4	5	8	8	16	60	1	7	9	1	3	3	9	12	15	62	3	7	2	5	7	7	5	17	9
Gulliver Lake	U. P.	93	12	21	5	3	3	10	11	4	20	90	17	12	8	3	1	7	17	9	16	93	5	11	4	11	13	10	14	13	12
Manistee	N. W.	62	2	17	11	10	4	9	3	2	4	60	1	16	3	9	3	6	13	8	1	62	0	3	5	10	11	10	12	11	0
Traverse City	N. W.	93	6	18	22	7	11	11	8	5	5	90	3	18	16	3	15	5	13	8	9	93	10	4	6	6	18	14	21	5	9
Alpena	N. E.	62	0	6	8	2	7	4	3	12	20	60	1	5	8	6	1	0	13	14	12	62	0	2	3	9	6	10	6	21	5
Harrisville	N. E.	93	0	1	16	0	10	0	18	0	48	90	0	0	20	0	14	0	22	0	34	93	0	1	11	1	11	2	48	1	18
Grand Haven	W.	45	0	3	14	10	4	3	4	1	6	60	1	8	11	8	5	4	7	6	10	62	1	4	3	12	10	8	11	7	6
Port Austin	B. & E.	93	7	27	24	5	2	10	3	9	6	90	1	11	23	3	1	3	25	15	8	93	1	5	7	2	5	12	42	11	8
Port Huron	B. & E.	62	0	7	11	9	5	7	6	3	14	60	0	4	7	7	3	9	12	11	7	62	0	2	3	5	9	17	11	10	5
Thornville	B. & E.	93	1	1	16	10	9	0	1	27	28	90	2	0	8	14	12	0	20	22	12	93	0	0	7	5	22	2	25	24	8
Alma	C.	93	34	11	13	2	2	3	6	9	13	90	19	8	12	3	0	2	23	9	14	93	15	4	10	1	5	9	22	16	11
Agr'l College	C.	93	15	21	16	9	3	2	4	20	3	90	12	3	15	9	3	6	22	14	6	93	23	2	5	2	8	7	22	16	8
Lansing, S. B. of H.	C.	93	5	11	9	3	11	10	18	12	14	90	4	10	18	2	3	18	12	7	16	93	0	13	6	5	5	14	29	9	12
Otsego	S. W.	93	0	11	9	13	4	8	2	40	6	90	0	9	8	10	3	18	8	27	7	93	0	3	2	2	9	20	8	45	4
Albion	S. C.	93	17	23	9	9	4	5	12	9	5	90	6	8	7	10	4	7	22	20	6	93	7	3	3	6	11	11	31	12	9
Ann Arbor	S. C.	93	4	31	9	7	5	1	7	13	16	90	11	12	5	8	1	4	20	16	13	93	24	3	3	5	9	4	14	14	17
Battle Creek	S. C.	93	0	21	20	4	1	6	3	25	13	90	1	10	17	5	7	2	4	25	19	93	0	5	1	4	19	17	21	15	11
Kalamazoo	S. C.	93	0	32	7	4	3	5	4	22	16	90	0	9	5	3	7	13	17	19	17	93	0	3	5	4	13	22	17	18	11
Marshall	S. C.	93	0	20	18	9	6	1	9	22	8	90	0	9	10	9	5	7	21	20	9	93	0	5	7	3	12	10	20	27	9
Birmingham	S. E.	87	8	26	7	3	2	3	6	13	19	89	12	11	3	9	0	10	17	16	11	90	2	3	4	5	4	22	13	28	9
Detroit	S. E.	62	0	5	12	4	3	3	10	3	22	60	1	4	8	1	2	5	21	11	7	62	1	3	5	6	4	7	20	12	4

* ‡ § For these references see foot-note to this table on page 78.

NOTE.—Diagram XII., page 77, exhibits lines showing, by months, directions of wind at each of 11 stations in this table, the cut for each month and station in said diagram representing the figures given in this table for the same month and station; it is explained on pages 75 and 76.

DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus, in Diagram I., page 30, relating to average temperature in 1889, tracing the line "— — —" representing Gulliver Lake, it may be seen that the average temperature at Gulliver Lake was, in January, about 22°, in April about 39°, in May about 47°, in July about 64°, in October about 40°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I, page 31, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average line given in each table is represented in the corresponding diagram by an × line, thus ××××××. The lines in the diagrams give more ready general comparisons of stations with each other, or of months, with each other, than is possible from the mere numerical statements. By Diagram II., page 36, it appears at a glance that the average daily range of temperature at Lansing and Marshall in 1889, was, during August, higher than at any other of the ten stations represented in that diagram, and during December was lower at Thornville. The marked agreement in the course of the lines in Diagram I., page 30, representing mean monthly temperature at seven stations, and also that the agreement is closer in January and August than in the other months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., page 30, relating to mean temperature by months in 1889, and those in Diagram III., page 41, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 70, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 1 P. M. and 3 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1889, at Lansing, the months of most wind were February, May and December. By reference to Diagram XI., page 72, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, February and December were, in 1889, the months of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The four diagrams relating to direction of the wind are constructed on a different principle and the manner of reading them is explained on preceding pages in this article.

TABLE XV.—*Average Daily Range of Atmospheric Pressure (as determined from three daily observations*) for the Year 1889, at each of 17 Stations, and the average lines for 12 Stations and for 5 Stations in Michigan—Stations arranged in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Average Daily Range of Barometer—Year and Months, 1889.													
	Norm. ‡	1888.	1889.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations...§	.....	.....	.201	.289	.249	.161	.233	.145	.133	.131	.115	.164	.211	.249	.331
Av. for 5 Stations...‖	.....	.....	.199	.283	.236	.161	.232	.149	.134	.133	.117	.159	.209	.248	.326
Marquette	4 .216	.226	.201	.283	.219	.158	.229	.167	.147	.134	.120	.175	.217	.248	.309
Gulliver Lake	2 .208	.216	.199	.293	.220	.153	.226	.139	.127	.131	.115	.168	.225	.242	.343
Alpena	7 .223	.225	.207	.289	.233	.165	.233	.145	.143	.141	.126	.177	.221	.256	.359
Traverse City	3 .217	.219	.195	.294	.224	.152	.227	.129	.123	.131	.102	.164	.217	.250	.332
Harrisville	5 .231	.240	.224	.318	.263	.186	.252	.157	.160	.150	.121	.205	.230	.263	.380
Manistee	.....	.....	.192	.269	.226	.149	.235	.136	.117	.134	.112	.157	.216	.239	.315
Port Austin	3 .226	.228	.223	a .316	.264	b .166	g .262	d .159	b .170	c .154	1 .142	1 .164	f .222	e .271	a .387
Alma	.....	.....	¶	.....	.....	.162	.236	.110	.157	a .179	.126	.169	.204	.263	.335
Grand Haven	.....	.204	**	.292	.241	.148	.222	.133	.125	.133	a .109	.....	h .182	.233	.318
Port Huron	7 .212	.209	.200	.291	.250	.164	.237	.150	.136	.132	.115	.146	.201	.250	.323
Thornville	6 .208	.209	.207	.289	.242	.178	.231	.167	.135	.134	.129	.173	.220	.257	.326
Agricultural College	7 .200	.198	.188	.287	.236	.150	.219	.134	.113	.110	.105	.166	.187	c .241	.296
Lansing, S. B. of H.	8 .204	.201	.197	.281	.248	.152	.229	.132	.123	.126	.119	.161	.210	.261	.320
Birmingham	3 .204	.204	.196	a .284	.244	b .160	d .220	a .142	b .142	d .127	b .106	b .159	.197	.252	a .318
Detroit	7 .207	.204	.194	.281	.251	.171	.225	.145	.127	.125	.110	.139	.192	.247	.318
Battle Creek	2 .192	.179	.205	291	.298	.160	.248	.165	.133	.119	.118	.150	.217	.240	.320
Ann Arbor	8 .204	.201	.194	.277	.247	.163	.228	.143	.127	.125	.107	.148	.197	.252	.316
Marshall	7 .204	.195	.193	.273	.253	.162	.222	.140	.125	.127	.110	.152	.204	.230	.313
Albion	.....	.....	††	.....	.....	.....	.....	b .137	b .132	a .118	b .107	.155	.200	.241	.308
Kalamazoo	5 .188	.198	.190	.265	.250	.148	.227	.129	.118	.126	.106	.155	.203	.232	.325

* At Stations of the U. S. Signal Service the observations during the year 1889, were made at 8 A. M., and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in star (*) foot note to Table I., page 81.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 10. The average atmospheric pressure at each of these stations, by months, in 1889, is given in Table XVII, page 87.

‡ Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the averge daily range, denote the number of years included in the average.

§ Not including in the U. S. Signal Service Stations.

‖ This line is an average for the 5 U. S. Signal Service Stations. It does not include Grand Haven.

¶ The average for 10 months in 1889 is .194. ** For 11 months, .194. †† For 8 months, .175.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f for 25 days. g For 23 days. h For 22 days. i for 20 days.

NOTE.—The latitude and elevations of some of the stations are stated in Exhibit 2, page 11.

The daily range is found by subtracting the lowest observation from the highest observation, 7 A. M. to 7 A. M.

TABLE XVI.—*Range of Atmospheric Pressure (as determined from 3 Daily Observations*) for the Year and for each Month and for the Average Month of the year 1889, at 17 and at each of the 17 Stations†, and Average lines for 12 Stations and for 5 Stations in Michigan; also the Norm.—Average Monthly Range for a series of years. Stations named in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Range of Barometer.—Year and Months, 1889.														
	Norm. §	1888.	1889.	Av. Month	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
For 12 Stations ‖	.....	.....	2.208	1.428	2.087	1.851	1.248	1.468	1.368	1.210	.993	.985	1.236	1.393	1.682	1.610
Av. for 12 Stations ¶	.....	.....	1.764	.946	1.622	1.336	.759	1.016	.658	.790	.588	.520	.798	.898	1.118	1.180
For 5 Stations**	.....	.....	1.890	1.122	1.740	1.370	.890	1.228	.717	.979	.880	.827	1.048	1.047	1.372	1.371
Av. for 5 Stations††	.....	.....	1.737	.944	1.576	1.269	.773	1.026	.611	.789	.644	.556	.823	.925	1.193	1.140
Marquette	1.441^{4}	1.623	1.633	.929	1.499	1.155	.727	1.059	.717	.785	.747	.621	.847	.789	1.129	1.068
Gulliver Lake	1.705^{2}	1.702	1.707	.948	1.589	1.239	.690	1.002	.535	.849	.728	.559	.835	.931	1.126	1.290
Alpena	1.240^{7}	1.670	1.850	.983	1.740	1.240	.770	1.010	.570	.840	.671	.609	.918	1.047	1.183	1.198
Traverse City	1.192^{8}	1.725	1.796	.907	1.681	1.187	.689	.937	.532	.788	.575	.495	.679	.862	1.167	1.290
Harrisville	1.314^{5}	1.682	1.790	.998	1.710	1.182	.812	1.059	.673	.903	.684	.560	.881	.992	1.185	1.335
Manistee	.....	.....	1.680	.905	1.500	1.270	.660	.913	.590	.780	.645	.460	.672	.904	1.174	1.292
Port Austin	1.789^{3}	1.677	1.901	1.007	1.780	1.332	.835	1.081	.713	.907	.667	.523	.751	.960	1.268	1.262
Alma	.....	.....	.....	‡‡	.....	.....	.916	.987	.618	.828	.876	.666	.575	.835	1.219	1.209
Grand Haven	.....	1.660	.....	§§	1.520	1.480	.700	.920	.650	.770	.590	.459	.....	.919	1.142	1.240
Port Huron	1.191^{7}	1.620	1.790	.967	1.610	1.340	.850	1.090	.590	.780	.590	.560	.860	.980	1.260	1.090
Thornville	1.212^{6}	1.595	1.797	1.004	1.643	1.350	.811	1.052	.666	.743	.592	.598	1.231	.943	1.273	1.150
Agr'l College	1.146^{7}	1.619	1.796	.925	1.597	1.401	.736	1.001	.621	.761	.509	.471	.809	.912	1.153	1.132
Lansing, S. B. of H.	1.116^{8}	1.600	1.762	.918	1.589	1.364	.747	.980	.599	.736	.551	.530	.741	.884	1.184	1.109
Birmingham	1.422^{3}	1.566	1.688	.921	1.517	1.355	.787	1.028	.634	.728	.536	.498	.755	.871	1.227	1.119
Detroit	1.155^{7}	1.630	1.730	.936	1.530	1.340	.860	1.060	.590	.760	.567	.530	.820	.903	1.220	1.050
Battle Creek	1.645^{2}	1.543	1.747	.984	1.747	1.388	.761	1.096	1.045	.828	.496	.483	.729	.878	1.184	1.174
Kalamazoo	1.195^{5}	1.527	1.771	.921	1.577	1.483	.721	.969	.639	.755	.583	.491	.676	.821	1.143	1.189
Ann Arbor	1.101^{8}	1.577	1.696	.920	1.501	1.377	.776	1.022	.632	.747	.548	.528	.788	.883	1.195	1.043
Marshall	1.129^{7}	1.600	1.714	.898	1.535	1.371	.746	.959	.604	.736	.581	.505	.706	.835	1.141	1.062
Albion	.....	.....	.....	¶¶	.....	.....	.....	.....	.663	.727	.519	.505	.752	.837	1.166	1.073

§ Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with Dec. 31, 1889. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

‖ Represents the difference between the highest of 12 stations and the lowest of 12 stations for year and for each month of year, not including the U. S. Signal Service Stations.

¶ Represents sum of ranges at 12 stations divided by 12.

** Represents the difference between the highest of 5 stations and the lowest of 5 stations for the year and for each month of the year.

†† An average for only the 5 U. S. Signal Service Stations. Grand Haven is not included.

‡‡ The average for 10 months in 1889 is .873. §§ For 11 months, .945. ¶¶ For 8 months, .780.

NOTE—The *, †, ‡ and a b c references and the note to Table XV., page 83, apply also to Table XVI.

EXHIBIT 34.—*Average Atmospheric Pressure, by Year and Months, in 1889, Compared with Annual and Monthly Averages for 1888, and for the Twelve Years, 1877–88. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1877-88*	29.162	29.202	29.195	29.157	29.127	29.126	29.111	29.124	29.151	29.196	29.189	29.178	29.181
1888 (12 stations)	29.158	29.278	29.129	29.203	29.250	29.065	29.069	29.166	29.144	29.174	29.070	29.202	29.143
1889 (12 stations)	29.128	29.068	29.177	29.089	29.116	29.060	29.100	29.104	29.192	29.131	29.228	29.135	29.141
In 1889 **Greater** than Av., for 12 years, 1877-88	.....	.....	.....	.....	.....	.....	.....	.....	.041	.....	.039	.....	.....
In 1889 **Less** than Av. for 12 years, 1877-88	.034	.134	.018	.068	.021	.166	.011	.020	.....	.065	.....	.043	.040
In 1889 **Greater** than in 1888	.....	.....	.048	.....	.....	.....	.031	.....	.048	.....	.158	.....	.....
In 1889 **Less** than in 1888	.030	.210	.....	.114	.134	.005	.....	.062	.....	.043	.....	.067	.002

* Kalamazoo for 1877-82 and 1885-8; Battle Creek for 1877-80, 1882 and 1888; Detroit for 1878-87; Woodmere Cemetery (near Detroit) for 1877-9; Mendon for 1877-8 and 1881-3; Marquette for 1879-84, and for 1886-7; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-88; Benton Harbor for 1877-8; Ypsilanti for 1877 and 1879; Agricultural College for 1877, 1881-8; Otisville for 1878-80 and 1882; Tecumseh for 1879-80 and 1882-5; Washington for 1879-80 and 1882-3; Nirvana for 1879 and in 1880 to April 25 inclusive; Reed City, for 1880 after April 25, and 1881-5; Thornville for 1880-1 and 1884-8; Escanaba for 1880 and 1882-7; Ann Arbor for 1881-8; Traverse City for 1882-8; Harrisville for 1882 and 1885-8; Hastings for 1882; Hillsdale for 1882-3; Port Austin for 1883-4 and 1888; Marshall for 1883-8; Manistique, Ionia for 1884-5; Mackinaw City for 1884-7; Swartz Creek for 1885; Birmingham for 1887-8; Gulliver Lake for 1888.

EXHIBIT 35.—*Comparisons of the Average Atmospheric Pressure during the Year and during each month of the Year 1889, with Averages for the 14 Years, 1875–88, and for the Year 1888. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 14 years, 1875-88	29.066	29.085	29.072	29.027	29.035	29.038	29.038	29.058	29.073	29.114	29.085	29.084	29.086
1888	29.108	29.202	29.070	29.154	29.202	29.023	29.032	29.119	29.103	29.128	29.027	29.167	29.070
1889	29.062	28.995	29.091	29.011	29.061	28.996	29.037	29.057	29.141	29.070	29.157	29.061	29.063
In 1889 **Greater** than Av. for 14 years, 1875-88	.....	.....	.019	.....	.026	.....	.....	.....	.068	.....	.072	.....	.....
In 1889 **Less** than Av. for 14 years, 1875-88	.004	.090	.....	.016	.....	.042	.001	.001	.....	.044	.....	.023	.023
In 1889 **Greater** than in 1888	.....	.....	.021	.....	.....	.....	.005	.....	.033	.....	.180	.....	.....
In 1889 **Less** than in 1888	.046	.207	.....	.143	.141	.027	.....	.062	.....	.058	.....	.106	.007

EXHIBIT 36.—*Average Daily Range of Atmospheric Pressure by Year and Months, in 1889, compared with Annual and Monthly Averages for 1888, and for the seven years, 1882–88. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Average Daily Range of Barometer.—Year and Months, 1889.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years, 1882-88*..	.212	.321	.317	.274	.209	.162	.141	.118	.133	.168	.211	.249	.254
1888 (12 stations).....	.207	.332	.302	.228	.240	.172	.137	.105	.137	.189	.217	.206	.228
1889 (12 stations).....	.201	.289	.249	.161	.233	.145	.133	.131	.115	.164	.211	.249	.331
In 1889 **Greater** than Av. for 7 years, 1882-88.....	.....	.....	.....	.....	.024	.....	.....	.013	.....	.....	.....	.....	.077
In 1889 **Less** than Av. for 7 years, 1882-88.	.011	.032	.068	.113	.....	.017	.008	.....	.018	.004	0	0	.....
In 1889 **Greater** than in 1888.....	.....	.....	.....	.....	.....	.....	.....	.026	.....	.....	.....	.043	.108
In 1889 **Less** than in 1888	.006	.043	.053	.067	.007	.027	.004	.....	.022	.025	.006	.....	.....

* Marquette for 1882-4 and 1886-7; Escanaba for 1882-7; Traverse City, Lansing, Ann Arbor for 1882-8; Grand Haven for 1882-7; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Detroit for 1883-7; Agricultural College, Marshall for 1883-8; Port Austin for 1883-4 and 1888; Washington and Mendon for 1888; Manistique, Ionia for 1884-5; Mackinaw City for 1884-7; Thornville for 1884-8; Harrisville for 1885-8; Swartz Creek for 1885; Battle Creek and Gulliver Lake for 1888; Kalamazoo for 1886-8; and Birmingham for 1887-8.

EXHIBIT 37.—*Range of Atmospheric Pressure, by Year and Months, in 1889, compared with Annual and Monthly Averages for 1888; and for the seven years 1882-88. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Range of Barometer.—Year and Months, 1889.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years, 1882-88*	.938	1.217	1.325	1.186	1.057	.763	.700	.545	.625	.833	1.002	1.060	1.119
1888 (12 stations)...	.916	1,283	1.609	1.062	1.003	.807	.609	.451	.603	.886	.933	.801	.940
1889 (12 stations)...	.946	1.622	1.336	.759	1.016	.658	.790	.588	.520	.798	.898	1.187	1.180
In 1889 **Greater** than Av. for 7 years, 1882-88.....	.008	.405	.011	.....	.....	.....	.090	.043	.....	.....	.....	.127	.061
In 1889 **Less** than Av. for 7 years, 1882-88.....	.....	.....	.....	.427	.041	.105	.....	.....	.105	.035	.104	.....	.....
In 1889 **Greater** than in 1888	.030	.339	.....	.....	.013	.....	.181	.137	.....	.....	.....	.386	.240
In 1889 **Less** than in 1888.....	.....	.....	.273	.303	.....	.149	.....	.....	.083	.088	.035	.....	.....

* Marquette for 1882-4 and 1886-7; Escanaba, Grand Haven for 1882-7; Traverse City, Lansing, Ann Arbor for 1882-8; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Detroit for 1883-7; Agricultural College for 1883-8; Port Austin for 1883-4 and 1888; Washington, Mendon for 1888; Marshall for 1883-5 and 1887-8; Manistique, Ionia for 1884-5; Mackinaw City for 1884-7; Thornville for 1884-8; Harrisville for 1885-8; Swartz Creek for 1885; Birmingham for 1887-8; Kalamazoo, Gulliver Lake, Battle Creek for 1888.

TABLE XVII.—*Average Atmospheric Pressure for the Year, and for each Month in the Year 1889, at each of 17 Stations in Michigan; also Average lines for 12 Stations and for 5 Stations, as indicated by the height, in inches, of Mercury in the Barometer. Corrected for Temperature.—Reduced to 32° F. (for some Stations not corrected for Instrumental Errors*).—Average of Observations made Daily at 7 A.M., 2 P. M., and 9 P. M.,† by observers‡ for the State Board of Health and for the U. S. Signal Service.*

Stations in Michigan.‡ (Those of the U. S. Signal Service in Italics.)	Divisions of the State.§	Inches of Mercury.—Atmospheric Pressure.													
		Years.		Months, 1889.											
		Norm.‖	1889.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations ¶			29.128	29.068	29.177	29.089	29.116	29.060	29.100	29.104	29.192	29.131	29.228	29.135	29.141
Av. for 5 Stations **			29.318	29.261	29.382	29.294	29.314	29.265	29.290	29.283	29.358	29.294	29.417	29.329	29.330
*Marquette**	U. P.	29.265 4	29.245	29.219	29.336	29.273	29.273	29.240	29.232	29.215	29.226	29.142	29.355	29.235	29.190
Gulliver Lake	U. P.	29.308 2	29.296	29.232	29.338	29.279	29.292	29.246	29.262	29.259	29.343	29.257	29.441	29.323	29.284
*Manistee**	N. W.		29.344	29.282	29.394	29.319	29.336	29.283	29.305	29.310	29.393	29.320	29.470	29.365	29.346
Traverse City	N. W.	29.335 8	29.317	29.251	29.377	29.299	29.315	29.271	29.273	29.265	29.345	29.287	29.444	29.336	29.335
*Alpena**	N. E.	29.354 17	29.346	29.285	29.396	29.314	29.335	29.282	29.307	29.309	29.391	29.334	29.472	29.366	29.361
Harrisville	N. E.	29.312 5	29.319	29.256	29.366	29.274	29.301	29.241	29.279	29.282	29.373	29.310	29.430	29.312	29.329
*Grand Haven**	W.		††	29.290	29.400	29.330	29.313	29.279	29.212	29.310	29.406		g 29.459	29.365	29.359
Port Austin	B. & E.	29.349 2	29.340	a29.272	29.376	b29.294	f 29.304	c 29.276	b29.293	b 29.301	h 29.386	h 29.398	e 29.446	d 29.375	a 29.359
*Port Huron**	B. & E.	29.330 11	29.345	29.294	29.401	29.300	29.329	29.275	29.324	29.308	29.402	29.351	29.422	29.347	29.333
Thornville	B. & E.	28.955 10	28.936	28.871	28.968	28.879	28.927	28.867	28.919	28.923	29.013	28.957	29.028	28.930	28.955
Alma	C.		‡‡			29.103	29.127	29.177	29.083	a28.945	29.242	29.219	29.327	29.191	29.187
Agricultural College*	C.	29.088 8	29.062	28.995	29.091	29.011	29.061	28.996	29.037	29.057	29.141	29.070	29.157	29.061	29.063
Lansing, S. B. of H.	C.	29.052 11	29.072	29.006	29.111	29.026	29.060	28.999	29.050	29.054	29.147	29.080	29.167	b29.076	29.085
Albion	S. C.		§§					l 28.871	28.980	a28.980	29.026	28.962	29.044	28.952	28.971
Ann Arbor	S. C.	29.031 9	29.021	28.969	29.069	28.961	29.005	28.955	28.998	28.999	29.094	29.029	29.099	29.021	29.050
Battle Creek	S. C.	29.094 2	29.061	29.018	29.159	29.046	29.056	28.949	29.038	29.048	29.136	29.049	29.128	29.045	29.055
Kalamazoo	S. C.	29.032 13	29.004	28.942	29.046	28.962	28.992	28.934	28.977	28.980	29.074	29.005	29.102	29.016	29.019
Marshall	S. C.	29.031 7	29.013	28.960	29.062	28.968	28.999	28.945	28.997	28.988	29.078	29.016	29 102	29.016	29.027
Tecumseh	S. C.		¶¶							29.085	g29.151	f 29.102	29.188	29.114	29.135
Birmingham	S. E.	29.111 3	29.108	a 29.045	29.166	b 29.073	d 29.080	a 29.043	b 29.072	b 29.086	b 29.175	b 29.117	29.191	29.113	a 29.132
*Detroit**	S. E.	29.319 17	29.311	29.227	29.381	29.265	29.298	29.243	29.281	29.275	29.379	29.324	29.364	29.331	29.359

* For stations marked thus * a correction has been made for instrumental error, as follows: For Marquette, .004 added; for Alpena, .006 added; for Grand Haven, .013 added, Jan. to Apr.; for Port Huron, .005 subtracted; for Detroit, .001 added for Jan., Mar. to Aug., Oct. and Nov.; for Agricultural College, .013 subtracted; for Manistee, .004 added. For other stations the instrumental error of barometer is not known.

† At the stations of the U. S. Signal Service during the year 1889, the observations were made at 8 A. M., and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table 1., page 31.

‡ The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 10.

§ The full names of divisions, and the counties in each division, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

‖ Numbers in this column state the average annual atmospheric pressure for periods of years ending in each case with Dec. 31, 1889. The small figures at the right of the numbers which state the average, denote the number of years included in the average.

¶ This line is an average for 12 stations, at which observations were made tri-daily, and from which reports, nearly complete, were received for every month in the year. It does not include Alma, Albion, Tecumseh and the U. S. Signal Service Stations. Green's standard barometer was used at all the 12 stations for 1889.

** This is an average line for the five U. S. Signal Service Stations. It does not include Grand Haven.

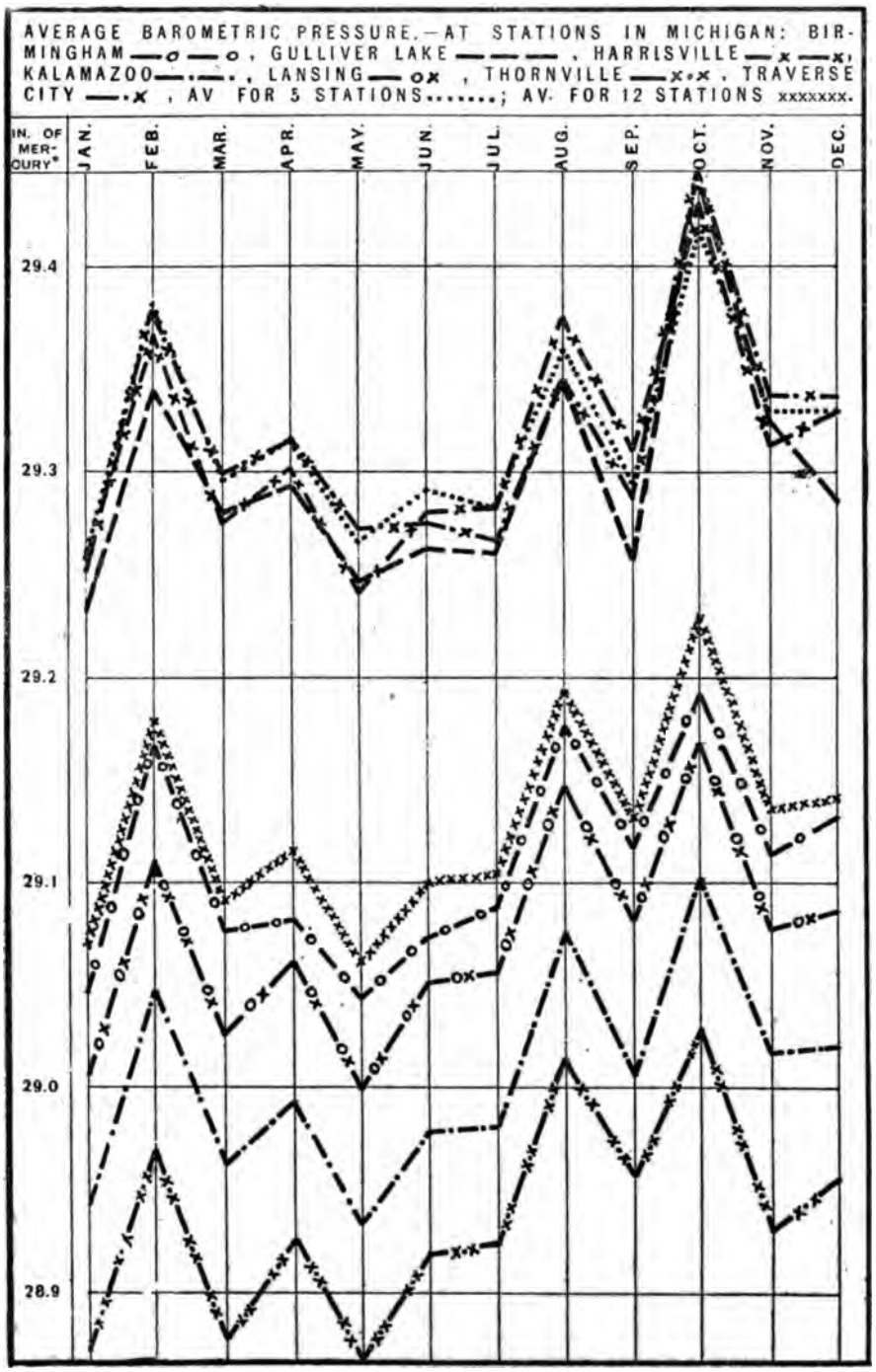
†† The average for 11 months in 1889 is 29.338. ‡‡ For 10 months, 29.160. §§ For 8 months, 28.961. ¶¶ For 6 months, 29.129.

NOTE.—Computations of monthly averages for the year 1889 were furnished by the observers at Alpena, Grand Haven, Port Huron, Detroit and Manistee. The remainder of the computations were made at the office of the State Board of Health.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 23 days. g For 22 days. h For 20 days. l For 18 days.

The lines for 7 stations in this table are graphically represented in Diagram XVII., page 88.

DIAGRAM XVI.—ATMOSPHERIC PRESSURE, BY MONTHS, IN 1889.



SCALE ONE TENTH INCH OF MERCURY TO 1.10 IN. VERTICALLY.

THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICKNESS.

A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF SICKNESS IN MICHIGAN DURING THE YEAR 1889, AND PRECEDING YEARS.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper is the thirteenth in a series of articles upon the same general subject, begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1889. It includes a series of diagrams or graphic illustrations which show by months in 1889, the rise and fall of twenty-eight of the most prominent diseases in Michigan.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation.

Tables are given showing the per cent of the weekly *reports* which stated the presence of the various diseases, first (in Exhibit IV.), for each of the years 1877–1889, and an average for 1877–1888; and secondly (in Exhibit IV. continued), by months, in the year 1889, in each of the years 1887–8; and the average for the period of years 1877–88, the diseases being arranged in the order of their greatest reported prevalence in 1889, to facilitate a comparison with the prevalence of the same diseases in previous years, and in corresponding months in previous years.

The per cent of *observers* stating the presence of each of the diseases is given in Table 1, for the year 1889, and, for comparison, for each of the years 1877–1888, and, in Table 1 continued, for the months in the year 1889, and, for comparison, by months in each of the years 1887–8, and the average by months for the period 1877–88.

Comparing Table 1, with Exhibit IV., we see the correspondence in the two lines of evidence,—that of the "prevalence" of the diseases as shown by the per cent of *reports*, and the "area of prevalence" as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1889.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of the more important diseases in the State, and to note the connection of this prevalence with each of the meteoro-

logical conditions in the State. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For these reasons the State Board of Health undertakes, by a compilation of the weekly reports of sickness in connection with the various meteorological conditions, to learn what causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of diseases in certain months as compared with other months in the same year, or with the same months in other years or series of years.

Since 1876, when this system of "weekly reports of sickness" was begun, an important work has been accomplished in learning the time of the greatest prevalence of each of several of the most important diseases, and consequently the time of greatest danger from each such disease in the State considered as a unit. To facilitate the study of the causes of sickness and deaths, the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit I., page 95. From some of these divisions sufficient data are not yet received to make the study of the comparative prevalence of diseases in different parts of the State practicable. The number of reports from localities in the newer parts of the State is increasing, however, and a comparison of sickness by localities may become practicable in the near future.

PHYSICIANS' WEEKLY REPORTS OF SICKNESS.

Weekly reports are now received concerning twenty-eight diseases, the names of which are printed on the blank postal used for the weekly report, and concerning these twenty-eight diseases a positive report is made each week by many of the leading physicians in Michigan.

Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; possibly a few health officers may have slight pay from their local boards of health. No other class of persons, however, has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

PLAN OF THE WEEKLY CARD-REPORTS.

The plan of the weekly reports remains the same as last year. (Cards having *Pleuritis* printed on them were first used for weekly reports in October, 1887.) Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in

sickness in 1889, when compared with the average for the twelve years, 1877–88. Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked *4*, and the following week, with the same number of cases, be marked *1*. Names of diseases and figures printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in .....[and vicinity?]

☞ PLEASE DATE. ☜

week ending Sat......, *189*...

Ed. 29.

Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked.

Please mail this, ☞ signed and dated, ☜ as soon as convenient after close of week specified.

	Prevalence, Order, See *.	*Cases.*
Brain, Inflammation of	*14*	*1*
Bowels, Inflammation of	*12*	*3*
Bronchitis	*11*	*4*
Cerebro-spinal Meningitis	*0*	*0*
Cholera Infantum	*8*	*9*
Cholera Morbus	*10*	*6*
Consumption, Pulmonary	*10*	*6*
Croup, Membranous	*12*	*3*
Diphtheria	*5*	*14*
Diarrhea	*3*	*17*
Dysentery	*8*	*9*
Erysipelas	*13*	*2*
Fever, Intermittent	*2*	*21*
Fever, Remittent	*11*	*4*
Fever, Typhoid (Enteric)	*0*	*0*
Fever, Typho-malarial	*9*	*7*
Influenza	*7*	*11*
Kidney, Inflammation of	*14*	*1*
Measles	*1*	*27*
Neuralgia	*14*	*1*
Pleuritis	*0*	*0*
Pneumonia	*9*	*7*
Puerperal Fever	*0*	*0*
Rheumatism	*6*	*12*
Scarlatina	*4*	*16*
Small-pox	*0*	*0*
Tonsillitis	*11*	*4*
Whooping-cough	*0*	*0*
Mumps	*6*	*12*
Dyspepsia	*11*	*4*

*. This report is of diseases UNDER YOUR OBSERVATION; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.

..... *M. D.*

BULLETINS OF HEALTH IN MICHIGAN.

During the year 1889 the issue of weekly and monthly bulletins of "Health in Michigan" has been continued. The weekly bulletin is compiled from the physicians' weekly reports from all parts of the State. It is designed to give, each week, information to the public concerning the diseases which cause most sickness in the State, the relative amount of sickness compared with the corresponding week in previous years, and compared with the preceding week—thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a similar comparison of the various meteorological conditions; also, a list of the localities in which each of the dangerous communicable diseases is reported present. If the newspapers would publish the localities where dangerous diseases are, the information would be valuable to parents who might thus be enabled to avoid taking their children to such places until after the disease had ceased and thorough disinfection had occurred. A copy of this bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part, in their papers. About forty copies are now used for this purpose each week. An abstract of it also goes to the Michigan Associated Press. The monthly bulletin is similar in character to the weekly bulletin. It is issued as soon as possible after the close of each month, and it is sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health. About eighty-five copies are thus used at the present time.

As a rule, about three-fourths of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletin. It is found that the statements made in the monthly bulletins are corroborated by the information obtained after the close of the year, in the compilation of the whole number of the reports for the corresponding months of the year.

COMPILATION OF THE WEEKLY REPORTS

The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of prevalence of the diseases for that time. There is also found for each locality what per cent of the reports state the presence of each disease for the given month. This per cent of reports for a single locality indicates what part of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the Reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3, is made by months for the State, so far as it is represented by the localities from which reports are received, showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

THE PREVALENCE OF THE SEVERAL DISEASES IN 1889.

By noting the per cent of all the reports received for a given time which stated the presence of each disease, the relative prevalence of the several diseases may be readily seen. This per cent has been computed for each disease, by months, for the year 1889. It is thus stated in Exhibit II., page 96, which also states the per cent for each disease for the year 1889, and an average for the period of twelve years, 1877–88. What per cent of the reports stated the presence of each disease by months in 1889, is graphically represented in Diagrams 1–5, on page 97, and following pages.

For eighteen diseases a comparison has been made of the amount of sickness in 1889 (as indicated by the proportion of reports stating the presence of the disease) with the average amount for a period of twelve years. These comparisons are shown in Exhibits XI., XIII., XVIII., and XX. A comparison is made in Table 1, page 105, between the per cent of observers reporting the tabulated diseases present in each of the years 1877–1889, and by months in three of those years; also an average by months for the period of twelve years, 1877–88. In Exhibit IV., on pages 99 and 100–1, the per cents of reports stating the presence of each of the twenty-eight tabulated diseases, by months, for each of the years 1887–9, and an average by months for the period of twelve years, 1877–88, is given. In Table 1, and in Exhibit IV., the diseases are arranged in the order of the greatest per cents for 1889, the highest being placed first.

A study of the reported sickness from twenty-eight diseases, in connection with meteorological conditions by months in 1889, is made in Exhibit X., and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it is more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months as compared with the average for the year, relations and comparisons are grouped for convenient comparison. A summary of one line of the evidence presented by these exhibits is given in Exhibits XXIV. and XXV.

In Exhibits VI. and VII., on pages 121, 122 and 123, the leading diseases are arranged in order according to the amount of sickness reported from them in 1889, those from which there was most sickness reported being placed first. In these exhibits the diseases are arranged with reference to the per cent of reports taken in connection with the average order of prevalence.

The comparison with former years is facilitated by reference to Exhibit II., page 96, Table 1, pages 105, 106 and 107, Exhibit IV., pages 99, 100 and 101, and Exhibits XI., XIII., XVIII., and XX.

Exhibit IV., on pages 99, 100 and 101, is continued for 1889. In it the diseases are arranged in order of the greatest per cent of reports stating the presence of the diseases in 1889, the highest per cent being placed first in the line. It is similar in form to Table 1, page 105, which shows the per cent of observers by whom diseases were reported present. It affords a means of comparing the diseases showing greatest prevalence with those showing greatest area of prevalence or widest distribution. It affords also a means for the comparison of per cent of reports in 1889, with the average per cent of reports in the twelve years, 1877–1888, both for the year and by months, also by months in 1889 with several of the years previous to 1889.

DISEASES FROM WHICH THERE WAS A MARKED INCREASE OR DECREASE IN PREVALENCE IN MICHIGAN IN 1889.

By referring to Exhibits II. and IV. it will be seen that there was no disease which showed a marked increase in 1889 over the average for the twelve years, 1877–88. The diseases in which the decrease in 1889 appears most marked are diphtheria, small-pox, measles, membranous croup, scarlet fever, intermittent fever, remittent fever, pneumonia and cerebro-spinal meningitis.

Change in Method of Comparison of Diseases by Years.

In former Reports mention has been made of diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the diseases in the current year and in the preceding year or term of years; now those diseases are mentioned of which the comparison shows an increase or decrease of twenty-five per cent from the preceding year, or from the normal, as the case may be.

In Exhibits XI., XIII., XVIII., and XX., the per cent of reports by months in 1889 is placed directly under the per cents for the corresponding months in 1888. A comparison between the corresponding months in the two years is thus made possible, and the comparison of the months in 1889 with the averages for the months in the series of years preceding is made possible by placing the differences, greater or less, in separate lines. But in order to make a proper comparison, the increase or decrease by per cent of difference from the preceding year or series of years should be computed.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to in the last paragraph on page 90.

EXHIBIT I.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the study of Causes of Sickness and of Deaths, with a list of Counties included in each Division.*

1.—Upper Peninsula.	2.—Northwestern.	3.—Northern.	4.—Northeastern.	5.—Western.	6.—Northern Central.	7.—Bay and Eastern.	8.—Central.	9.—Southwestern.	10.—Southern-Central.	11.—Southeastern.
Alger.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Baraga.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Chippewa.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Delta.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Gogebic.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Houghton.	Wexford.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham		Lenawee.	
Iron.		Otsego.	Presque Isle.	Ottawa.	Missaukee.	St. Clair.	Ionia.		St. Joseph.	
Isle Royal.					Osceola.	Tuscola.	Livingston.		Washtenaw.	
Keweenaw.							Montcalm.			
Luce.							Shiawassee.			
Mackinac.										
Marquette.										
Menominee.										
Ontonagon.										
Schoolcraft.										

On pages 230 and 253 of the Report of this Board for 1885, the divisions and the counties in each were indicated by lines on maps of the State. Similar maps appear in the articles on diphtheria and scarlet fever near the end of the present Report.

EXHIBIT II.—*Stating for each of 28 Diseases for the Year ending Saturday, December 28, 1889, by Months of the year 1889, and the average for the period of twelve years, 1877-88, on what Per Cent of the reports received each Disease was stated to be present.—Compiled from weekly reports by Health Officers of Cities and Villages, by Regular Correspondents of the State Board of Health, and by other physicians.**

Diseases.	Average, 1877-88.	What Per Cent of the Reports received stated the Presence of the Disease.												
		Year, 1889.	Months, 1889.											
			Jan.	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average †	29	23	23	22	24	23	23	21	24	27	28	26	23	22
Brain, Inflammation of	6	5	4	5	6	7	5	5	3	5	5	6	5	6
Bowels, Inflamation of	15	14	10	10	10	8	13	11	17	19	17	17	14	16
Bronchitis	61	58	65	68	69	68	61	50	49	44	51	57	64	62
Cerbrero-spinal Meningitis	4	3	1	3	3	3	4	1	2	5	4	2	2	2
Cholera Infantum	13	11	2	1	1	1	1	4	23	44	40	7	2	1
Cholera Morbus	18	14	2	1	1	4	5	8	32	58	40	11	2	2
Consumption, Pulmonary	62	48	49	49	50	50	46	47	47	46	50	52	49	51
Croup, Membranous	6	3	5	3	4	3	2	1	1	1	2	4	3	4
Diphtheria	19	6	9	3	6	5	5	4	3	4	7	11	8	9
Diarrhea	47	45	27	25	29	29	33	37	68	85	77	56	34	27
Dysentery	19	17	8	4	5	6	7	6	23	55	51	20	11	6
Erysipelas	24	22	25	22	27	28	21	22	18	20	17	18	22	23
Fever, Intermittent	68	43	36	33	34	48	41	44	50	51	50	47	42	39
Fever, Remittent	46	30	26	22	24	30	22	25	30	35	41	42	30	26
Fever, Typhoid (Enteric)	12	10	8	5	3	3	4	5	5	12	19	25	19	12
Fever, Typho-malarial	21	16	12	9	10	13	9	8	11	22	31	33	15	12
Influenza	39	32	42	44	48	50	34	22	16	16	21	33	30	37
Kidney, Inflammation of	21	20	19	18	22	21	22	26	25	17	19	17	19	19
Measles	13	6	5	4	4	7	10	11	7	3	3	4	6	9
Neuralgia	66	63	64	65	63	70	65	63	60	55	58	60	66	69
Pleuritis	.....	17	23	20	27	24	17	14	12	10	11	13	17	17
Pneumonia	35	26	41	45	44	38	29	16	11	12	13	23	29	27
Puerperal Fever	5	5	6	4	5	5	5	4	4	4	4	8	5	5
Rheumatism	68	65	66	63	66	71	70	69	64	56	60	65	64	67
Scarlatina	16	10	19	11	9	12	13	9	7	4	4	11	10	9
Small-pox	0.9	.03	2	1	0	0.3	0	0	0	0	0	0	0.2	1
Tonsilitis	48	46	55	54	54	52	46	39	31	34	35	47	58	57
Whooping-cough	19	16	14	15	19	21	19	15	18	15	18	15	10	12
No. of reports received	4,304	5,000	448	348	343	330	485	401	487	417	416	512	414	399

* For 1889 the names of observers are stated in Exhibit V., pages 102, 103 and 104.
† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

Statements in this exhibit for months in 1889 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page, and on following pages.

DIAGRAM I.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1889.

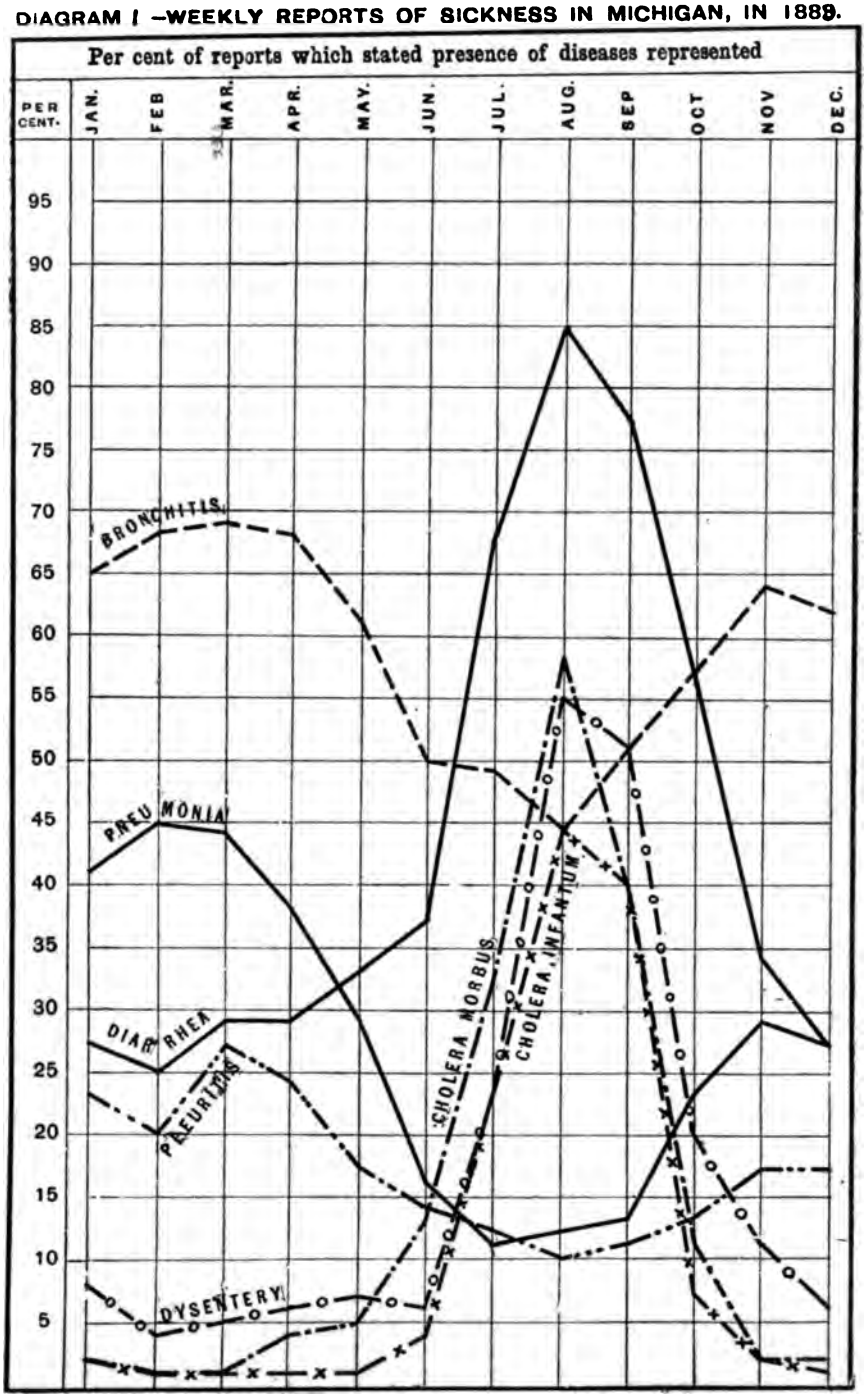


EXHIBIT III.—*Stating, by Months of the Year ending Saturday, December 28, 1889, for the State, and for each of the Eleven Geographical Divisions of Michigan from which Weekly Reports of Diseases were received, the number of Observers from whom the Reports where received; the Number of Reports received; the day on which, for the purposes of this compilation, each month is made to end; and the Number of Weeks thus included in each Month.*

Months, 1889.	Months and Year end Saturday.	Number of weeks.	State.		Divisions of the State.*																			
					1. Upper Peninsular*		2. Northwestern.*		3. Northern.*		4. Northeastern.*		5. Western.*		6. Northern Central.*		7. Bay and Eastern.*		8. Central.*		9. Southwestern.*		10. Southern Central.*		11. Southeastern.*	
			Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Rep rts.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†
Year 1889‡	Dec. 28, 1889	52	1203	5,000	80	337	33	140	25	109	47	201	108	454	54	228	200	801	205	847	119	496	201	843	131	544
Av. per month			100	417	7	28	3	12	2	9	4	17	9	38	5	19	17	67	17	71	10	41	17	70	11	45
January	February 2	5	92	448	6	30	3	15	3	15	4	20	7	34	6	29	14	65	15	74	8	38	14	69	12	59
February	March 2	4	89	348	6	23	3	12	3	12	4	15	7	28	6	23	13	50	15	58	7	28	14	56	11	43
March	March 30	4	89	343	6	24	3	12	3	12	4	16	7	27	5	20	15	54	14	54	7	23	14	53	11	43
April	April 27	4	86	330	4	16	3	11	2	8	3	12	8	31	6	22	14	51	15	59	8	29	13	52	10	39
May	June 1	5	102	485	8	36	2	10	2	10	4	19	9	45	5	25	14	65	20	97	11	58	17	77	10	48
June	June 29	4	103	401	7	28	2	8	2	8	4	16	9	35	5	20	16	59	21	81	10	40	17	67	10	39
July	August 3	5	103	487	7	33	2	10	2	10	4	20	10	46	4	20	18	85	19	86	10	45	17	85	10	47
August	August 31	4	109	417	8	32	3	11	2	8	4	16	11	41	4	16	19	71	17	64	11	44	19	73	11	41
September	September 28	4	110	416	7	28	3	12	2	8	4	16	11	44	4	14	19	70	17	63	12	45	19	73	12	43
October	November 2	5	107	512	7	34	3	15	2	10	4	19	10	49	3	15	19	91	17	80	12	56	19	91	11	52
November	November 30	4	109	414	8	29	3	12	1	4	4	16	10	39	3	12	20	70	18	67	12	47	19	74	11	44
December	December 28	4	104	399	6	24	3	12	1	4	4	16	9	35	3	12	19	70	17	64	11	43	19	73	12	46

* The counties in each division are given in Exhibit I., page 95. † From some of the observers reports were not received every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 126; the average number per month was 94. The names of observers and number of cards received from each observer for each month and for the year are stated in Exhibit V., pages 102, 103, 104.

EXHIBIT IV.—*Stating for each of 28 Diseases for the period of Twelve Years ending Saturday, December 28, 1888, and for each of those Years and 1889, on what Per Cent of the Reports received the Diseases were stated to be Present. Compiled from Weekly Reports by Health Officers of Cities and Villages and by regular Correspondents of the State Board of Health.* (Continued for each month of several of the above mentioned years on pages 100 and 101.)*

Line Number.	Diseases.	What Per Cent of the Reports stated the Presence of the Disease.													
		Average, 1877-88.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Average disease†	29	23	24	25	26	26	29	30	30	33	32	33	30	28
1	Rheumatism	68	65	66	69	70	68	70	68	68	71	71	72	68	60
2	Neuralgia	66	63	62	67	67	68	70	69	68	65	64	59	----	----
3	Bronchitis	61	58	59	55	56	56	61	66	65	62	64	64	64	55
4	Consumption, Pul.‡	62	48	49	51	55	58	63	61	66	71	68	70	71	----
5	Tonsillitis‡	48	46	41	47	49	50	50	50	48	48	49	45	----	----
6	Diarrhea	47	45	41	48	45	46	52	49	48	52	47	48	41	41
7	Intermittent Fever	68	43	45	48	54	59	65	69	71	82	82	82	82	75
8	Influenza	39	32	32	33	35	34	41	43	40	35	42	45	44	41
9	Remittent Fever‡	46	30	34	32	34	36	44	41	48	54	56	57	58	52
10	Pneumonia	35	26	30	28	27	27	29	38	39	41	42	41	41	40
11	Erysipelas	24	22	24	24	23	24	26	25	22	23	25	25	21	20
12	Inflam. of Kidney‡	21	20	19	18	20	21	26	----	----	----	----	----	----	----
13	Dysentery	19	17	17	19	17	15	23	21	17	23	18	18	19	21
14	Pleuritis‡	----	17	18	----	----	----	----	----	----	----	----	----	----	----
15	Whooping-cough	19	16	9	14	20	14	23	15	17	16	32	23	21	21
16	Typho-mal. Fever‡	21	16	15	16	16	16	20	18	24	29	24	22	24	26
17	Cholera Morbus	18	14	15	19	17	17	22	18	17	26	20	19	14	15
18	Inflam. of Bowels‡	15	14	14	16	17	17	17	16	13	14	12	----	----	----
19	Cholera Infantum	13	11	11	13	14	11	15	14	12	18	14	14	11	11
20	Typhoid Fever (ent.)	12	10	10	10	8	8	12	11	14	18	14	12	10	14
21	Scarlet Fever	16	10	9	8	11	12	16	19	18	19	15	23	25	21
22	Measles	13	6	16	14	6	5	10	24	11	26	19	12	5	7
23	Diphtheria	19	6	7	10	13	14	15	17	25	34	27	29	23	19
24	Inflam. of Brain‡	6	5	5	6	5	6	7	6	5	5	6	----	----	----
25	Puerperal Fever	5	5	4	6	5	6	7	7	7	5	3	3	3	4
26	Cerebro-spi. Men.	4	3	3	3	4	6	7	5	6	9	2	2	2	3
27	Membranous Croup	6	3	4	4	5	5	6	6	7	9	6	7	7	6
28	Small-pox	0.9	.03	.03	.02	0.4	0.2	0.1	0.3	3	2	0.4	0.4	0.2	4
	No. of reports received	4,312	5,000	5,047	4,896	5,683	5,108	3,957	4,458	4,745	3,567	3,991	3,755	3,221	3,320

* For 1889 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 98, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 102, 103 and 104.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year), what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month.

[‡ For foot-note see page 104.]

EXHIBIT IV.—CONTINUED.—*Stating, for each of 28 Diseases, by Months, on what Per 1887-1889; also the Averages by Months for the*

What Per Cent of the Reports Received Stated Presence of the Disease.‡

Line Number.	January.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	February.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	March.* Diseases.	Av. '77-'88.	1889.	1888.	1887.
	Average Disease †..	29	23	24	26	Average Disease †..	28	22	26	27	Average Disease †..	30	24	27	28
1	Rheumatism	73	66	66	76	Bronchitis	76	68	76	69	Bronchitis	76	69	74	67
2	Bronchitis	75	65	63	67	Neuralgia	71	65	68	73	Rheumatism	75	66	74	77
3	Neuralgia	69	64	66	72	Rheumatism	73	63	73	74	Neuralgia	74	63	71	76
4	Tonsillitis	59	55	55	56	Tonsillitis	61	54	55	59	Tonsillitis	61	54	60	61
5	Consumption Pul..	62	49	50	53	Consumption, Pul.	63	49	51	54	Consumption, Pul.	65	50	52	61
6	Influenza	54	42	43	47	Pneumonia	61	45	51	51	Influenza	58	48	53	50
7	Pneumonia	56	41	42	48	Influenza	60	44	56	52	Pneumonia	59	44	54	50
8	Intermittent Fev..	55	36	40	39	Intermittent Fev..	57	33	41	42	Intermittent Fev..	60	34	45	48
9	Diarrhea	27	27	23	28	Diarrhea	28	25	26	32	Diarrhea	29	29	31	31
10	Remittent Fever ..	38	26	31	29	Remittent Fever ..	37	22	35	26	Pleuritis	...	27	29	...
11	Erysipelas	26	25	26	23	Erysipelas	27	22	28	28	Erysipelas	28	27	26	32
12	Pleuritis	...	23	24	...	Pleuritis	...	20	32	...	Remittent Fever..	39	24	32	27
13	Inflam. of Kidney.	24	19	22	22	Inflam. of Kidney.	24	18	20	22	Inflam. of Kidney.	24	22	23	23
14	Scarlet Fever	21	19	15	11	Whooping-cough..	19	15	11	15	Whooping-cough..	19	19	11	15
15	Whooping-cough	19	14	9	12	Scarlet Fever	21	11	11	11	Typho-mal. Fever.	13	10	8	10
16	Typho-mal. Fever.	16	12	11	10	Inflam. of Bowels.	13	10	13	16	Inflam. of Bowels.	15	10	17	17
17	Inflam. of Bowels.	14	10	18	16	Typho-mal. Fever.	15	9	10	12	Scarlet Fever	22	9	9	12
18	Diphtheria	25	9	9	13	Typhoid Fev.(ent.)	8	5	7	10	Diphtheria	19	8	7	11
19	Dysentery	7	8	6	7	Inflam. of Brain..	6	5	6	9	Inflam. of Brain..	6	6	6	6
20	Typhoid Fev.(ent.)	11	8	10	6	Puerperal Fever...	5	4	5	5	Puerperal Fever...	7	5	8	7
21	Puerperal Fever...	5	6	5	5	Measles	14	4	25	17	Dysentery	8	5	6	10
22	Measles	11	5	16	11	Dysentery	7	4	6	8	Measles	17	4	28	22
23	Membran. Croup..	11	5	7	10	Diphtheria	14	3	10	11	Membran. Croup..	8	4	6	4
24	Inflam. of Brain ..	6	4	6	9	Cer.-spinal Men....	5	3	3	3	Typhoid Fev.(ent.)	6	3	6	4
25	Small-pox	1.4	2	0.6	0	Membran. Croup..	9	3	5	6	Cer.-spinal Men....	5	3	4	2
26	Cholera Infantum.	2	2	1	3	Small-pox	1.1	1	1	0	Cholera Infantum.	2	1	2	2
27	Cholera Morbus...	4	2	4	4	Cholera Morbus...	5	1	2	3	Cholera Morbus...	5	1	4	3
28	Cer.-spinal Men..	4	1	2	2	Cholera Infantum.	2	1	0.7	3	Small-pox	0.8	0	0.3	0
	Reports Received §	358	448	358	393	Reports Received §	335	348	430	379	Reports Received §	356	343	375	424

Line Number.	April.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	May.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	June.* Diseases.	Av. '77-'88.	1889.	1888.	1887.
	Average Disease †..	29	23	26	26	Average Disease †..	28	23	24	25	Average Disease †..	26	21	23	24
1	Rheumatism	75	71	70	77	Rheumatism	71	70	70	71	Rheumatism	68	69	69	70
2	Neuralgia	72	70	68	71	Neuralgia	67	65	62	67	Neuralgia	64	63	56	65
3	Bronchitis	70	68	68	62	Bronchitis	61	61	63	57	Bronchitis	53	50	55	49
4	Tonsillitis	53	52	50	53	Consumption, Pul.	63	46	58	54	Consumption, Pul.	62	47	56	48
5	Consumption, Pul.	66	50	47	61	Tonsillitis	46	46	41	46	Intermittent Fev..	75	44	44	52
6	Influenza	51	50	41	43	Intermittent Fev..	73	41	46	52	Tonsillitis	40	39	32	37
7	Intermittent Fev..	68	48	45	50	Influenza	37	34	32	34	Diarrhea	45	37	36	52
8	Pneumonia	52	38	44	41	Diarrhea	36	33	30	36	Inflam. of Kidney.	21	26	20	19
9	Remittent Fever..	42	30	31	30	Pneumonia	39	29	40	34	Remittent Fever..	45	25	30	30
10	Diarrhea	32	29	29	32	Inflam. of Kidney.	23	22	22	20	Influenza	27	22	24	23
11	Erysipelas	29	28	30	29	Remittent Fever..	44	22	33	30	Erysipelas	24	22	27	23
12	Pleuritis	...	24	23	...	Erysipelas	27	21	27	27	Pneumonia	24	16	24	16
13	Whooping-cough ..	17	21	11	13	Whooping-cough ..	18	19	11	16	Whooping-cough..	19	15	9	15
14	Inflam. of Kidney.	24	21	24	21	Pleuritis	...	17	18	...	Pleuritis	...	14	14	...
15	Typho-mal. Fever.	12	13	11	10	Scarlet Fever	18	13	11	6	Measles	22	11	30	19
16	Scarlet Fever	20	12	14	10	Inflam. of Bowels.	14	13	15	16	Inflam. of Bowels.	16	11	13	15
17	Inflam. of Bowels.	13	8	15	11	Measles	26	10	37	25	Scarlet Fever	15	9	9	4
18	Measles	23	7	35	22	Typho-mal. Fever.	11	9	10	6	Typho-mal. Fever.	12	8	11	7
19	Inflam. of Brain...	7	7	6	5	Dysentery	9	7	7	11	Cholera Morbus...	18	8	15	25
20	Dysentery	8	6	6	8	Diphtheria	16	5	7	6	Dysentery	13	6	8	14
21	Diphtheria	18	5	8	5	Inflam. of Brain...	6	5	4	8	Typhoid Fev.(ent.)	6	5	5	4
22	Puerperal Fever...	5	5	4	8	Cholera Morbus...	8	5	6	13	Inflam. of Brain...	6	5	5	8
23	Cholera Morbus ...	6	4	4	4	Puerperal Fever...	5	5	5	5	Puerperal Fever...	5	4	3	7
24	Cer.-Spinal Men...	6	3	4	3	Typhoid Fev.(ent.)	5	4	4	3	Cholera Infantum.	11	4	9	13
25	Typhoid Fev.(ent.)	6	3	5	3	Cer.-spinal Men....	6	4	2	5	Diphtheria	13	4	5	5
26	Membran. Croup..	7	3	7	6	Membran. Croup..	5	2	5	5	Membran. Croup..	4	1	3	2
27	Cholera Infantum.	2	1	2	1	Cholera Infantum.	3	1	3	5	Cer.-spinal Men...	5	1	3	4
28	Small-pox	1.4	.3	0	0	Small-pox	2	0	0.2	0	Small-pox	1.6	0	0	0
	Reports Received §	308	330	361	306	Reports Received §	349	485	483	367	Reports Received §	355	401	388	515

* For 1889 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 98, the names of observers and the number of reports received from each are stated in Exhibit V., pages 102, 103 and 104.

† The numbers in this line are an average, not for all diseases represented, but only for those reported *present in the given month.* ‡ See foot-note with this mark on page 104.

§ *The numbers in this line state how many* reports were received for the month in the given year.

Cent of the Reports Received the Diseases were stated to be Present in each of the Years Period of Twelve Years, 1877-1888.

What Per Cent of the Reports Received Stated Presence of the Disease.‡

July.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	August.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	September.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	Line Number.
Average Disease*..	29	24	22	27	Average Disease*..	31	27	25	29	Average Disease*..	32	28	25	26	
Diarrhea	72	68	60	82	Diarrhea	85	85	78	85	Diarrhea	79	77	73	71	1
Rheumatism	61	64	58	57	Cholera Morbus	56	58	48	55	Rheumatism	61	60	61	66	2
Neuralgia	60	60	57	62	Rheumatism	57	56	53	61	Neuralgia	60	58	51	65	3
Intermittent Fev.	76	50	47	53	Neuralgia	58	55	58	59	Bronchitis	48	51	49	47	4
Bronchitis	43	49	41	41	Dysentery	54	55	51	55	Dysentery	47	51	43	37	5
Consumption, Pul.	59	47	51	48	Intermittent Fev.	76	51	46	55	Consumption, Pul.	57	50	44	45	6
Cholera Morbus	47	32	33	59	Consumption, Pul.	56	46	49	47	Intermittent Fev.	76	50	48	53	7
Tonsillitis	31	31	24	29	Bronchitis	41	44	39	38	Remittent Fever	57	41	47	41	8
Remittent Fever	48	30	28	31	Cholera Infantum	47	44	40	45	Cholera Infantum	35	40	29	21	9
Inflam. of Kidney	18	25	15	13	Remittent Fever	55	35	41	40	Cholera Morbus	38	40	34	31	10
Cholera Infantum	31	23	23	44	Tonsillitis	31	34	21	31	Tonsillitis	36	35	27	38	11
Dysentery	31	23	25	36	Typho-mal. Fever	24	22	16	27	Typho-mal. Fever	38	31	26	33	12
Whooping-cough	21	18	8	22	Erysipelas	19	20	20	18	Influenza	29	21	19	27	13
Erysipelas	20	18	19	17	Inflam. of Bowels	20	19	16	21	Typhoid Fev.(ent.)	20	19	18	22	14
Inflam. of Bowels	18	17	17	20	Inflam. of Kidney	18	17	16	12	Inflam. of Kidney	16	19	14	14	15
Influenza	19	16	13	13	Influenza	20	16	12	18	Whooping-cough	20	18	9	11	16
Pleuritis	...	12	8	...	Whooping-cough	21	15	7	18	Inflam. of Bowels	16	17	14	17	17
Typho-mal. Fever	15	11	7	13	Typhoid Fev.(ent.)	13	12	12	14	Erysipelas	17	17	17	18	18
Pneumonia	15	11	13	10	Pneumonia	13	12	10	8	Pneumonia	16	13	15	14	19
Measles	14	7	10	15	Pleuritis	...	10	8	...	Pleuritis	...	11	9	...	20
Scarlet Fever	12	7	6	3	Cer.-spinal Men.	4	5	2	4	Diphtheria	17	7	7	7	21
Typhoid Fev.(ent.)	7	5	7	8	Inflam. of Brain	7	5	5	6	Inflam. of Brain	6	5	6	5	22
Puerperal Fever	5	4	4	6	Puerperal Fever	5	4	3	7	Cer-spinal Men.	4	4	2	3	23
Diphtheria	13	3	5	5	Scarlet Fever	11	4	4	4	Puerperal Fever	5	4	4	7	24
Inflam. of Brain	6	3	5	7	Diphtheria	14	4	6	6	Scarlet Fever	12	4	6	7	25
Cer.-spinal Men.	4	2	2	3	Measles	7	3	3	6	Measles	5	3	3	4	26
Membran. Croup	2	1	0.5	1	Membran. Croup	2	1	0.8	2	Membran. Croup	4	2	1	2	27
Small-pox	1.3	0	0	0	Small-pox	0.6	0	0	0	Small-pox	0.4	0	0	0.3	28
Reports Received §	370	487	400	412	Reports Received §	396	417	523	507	Reports Received §	399	416	414	382	

October.* Diseases.	Av. '87-'88.	1889.	1888.	1887.	November.* Diseases.	Av. '77-'88.	1888.	1888.	1887.	December.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	Line Number.
Average Disease*..	30	26	23	25	Average Disease*..	29	23	22	24	Average Disease*..	28	22	23	24	
Rheumatism	67	65	70	66	Neuralgia	67	66	64	66	Neuralgia	69	69	62	65	1
Neuralgia	63	60	62	66	Bronchitis	65	64	59	57	Rheumatism	73	67	69	70	2
Bronchitis	55	57	59	57	Rheumatism	71	64	68	69	Bronchitis	70	62	65	61	3
Diarrhea	54	56	37	46	Tonsillitis	54	58	49	54	Tonsillitis	59	57	49	57	4
Consumption, Pul.	60	52	43	48	Consumption, Pul.	61	49	44	47	Consumption, Pul.	61	51	48	50	5
Intermittent Fev.	74	47	48	50	Intermittent Fev.	65	42	43	42	Intermittent Fev.	57	39	38	39	6
Tonsillitis	44	47	35	47	Diarrhea	35	34	31	34	Influenza	47	37	40	38	7
Remittent Fever	55	42	39	42	Influenza	40	30	31	35	Diarrhea	28	27	25	30	8
Typho-mal. Fever	41	33	31	30	Remittent Fever	46	30	33	31	Pneumonia	43	27	33	31	9
Influenza	32	33	28	28	Pneumonia	32	29	24	28	Remittent Fever	40	26	30	31	10
Typhoid Fev.(ent.)	21	25	16	18	Erysipelas	23	22	23	26	Erysipelas	24	23	30	25	11
Pneumonia	21	23	17	17	Inflam. of Kidney	19	19	18	16	Inflam. of Kidney	21	19	21	17	12
Dysentery	24	20	15	18	Typhoid Fev.(ent.)	20	19	12	15	Pleuritis	...	17	22	...	13
Erysipelas	21	18	22	21	Pleuritis	...	17	16	...	Inflam. of Bowels	14	16	13	15	14
Inflam. of Bowels	14	17	12	13	Typho-mal. Fever	31	15	24	17	Whooping-cough	18	12	12	9	15
Inflam. of Kidney	20	17	15	18	Inflam. of Bowels	13	14	12	11	Typhoid Fev.(ent.)	14	12	10	11	16
Whooping-cough	17	15	8	9	Dysentery	11	11	9	7	Typho-mal. Fever	21	12	15	9	17
Pleuritis	...	13	15	...	Whooping-cough	18	10	8	10	Measles	7	9	3	11	18
Scarlet Fever	15	11	9	9	Scarlet Fever	16	10	9	10	Diphtheria	25	9	6	12	19
Diphtheria	24	11	7	16	Diphtheria	26	8	5	19	Scarlet Fever	17	9	13	11	20
Cholera Morbus	15	11	11	10	Measles	6	6	2	9	Inflam. of Brain	5	6	5	6	21
Puerperal Fever	5	8	4	3	Inflam. of Brain	5	5	7	3	Dysentery	7	6	4	9	22
Cholera Infantum	13	7	7	6	Puerperal Fever	5	5	3	4	Puerperal Fever	5	5	3	5	23
Inflam. of Brain	5	6	5	5	Membran. Croup	8	3	3	8	Membran. Croup	9	4	5	6	24
Measles	5	4	4	5	Cer.-spinal Men.	3	2	3	3	Cer.-Spinal Men.	3	2	2	2	25
Membran. Croup	5	4	4	4	Cholera Infantum	4	2	2	3	Cholera Morbus	5	2	4	4	26
Cer.-spinal Men.	4	2	3	3	Cholera Morbus	7	2	7	4	Small-pox	0.7	1	1	0	27
Small-pox	0.4	0	0	0	Small-pox	0.7	0.2	0.5	0	Cholera Infantum	2	1	3	2	28
Reports Received §	381	512	500	376	Reports Received §	358	414	405	474	Reports Received §	370	399	415	361	

*,† ‡ These notes are on page 99.

§ This foot-note is on page 100.

EXHIBIT V.—*By Months and by Geographical Divisions of the State,* the Names of 137 Observers, whose Weekly Reports of Diseases for 1889 are Compiled in Tables 1, 2, 3 and 4, the Localities[a] for which they Report, and the Number of Reports Received from Each Observer.*

Divisions and localities represented and physicians who reported. (Health Officers in Italics.)	Weekly Reports in 1889, Compiled in this Article.												
	Year, 1889.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All localities	5,000	448	348	343	330	485	401	487	417	416	512	414	399
Upper Peninsular Division*	337	30	23	24	16	36	28	33	32	28	34	29	24
Allouez, *Fred K. Smith, M. D.*	48	5	4	4	4	5	4	5	4	4	5	4	----
Dagget, C. Wackenreiter, M. D.	13	5	4	4	----	----	----	----	----	----	----	----	----
Ishpeming, *G. G. Barnett, M. D.*	25	5	4	4	4	5	4	----	----	----	----	----	----
Ironwood, *J. K. Niven, M. D.*	20	----	----	----	----	4	----	4	4	----	----	4	4
Lake Linden, *Geo. W. Orr, M. D.*	34	----	----	----	----	4	4	5	4	4	5	4	4
Negaunee, *M. R. Morse, M. D.*	50	5	3	4	4	5	4	4	4	4	5	4	4
Ontonagon, *J. P. Jordan, M. D.*	20	----	----	----	----	----	----	----	4	4	4	4	4
Rockland, *W. A. Burnham, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Red Jacket, *C. H. Rodi, M. D.*	28	----	----	----	----	4	4	5	4	4	5	2	----
Sault Ste. Marie, *H. R. Floyd, M. D.*	46	5	4	4	----	4	4	5	4	4	5	3	4
Northwestern Division*	140	15	12	12	11	10	8	10	11	12	15	12	12
Fife Lake, *J. D. Williams, M. D.*	17	5	4	4	4	----	----	----	----	----	----	----	----
Frankfort, *I. Voorheis, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Manistee, *John Kinsley, M. D.*	16	5	4	4	3	----	----	----	----	----	----	----	----
Manistee, *J. A. King, M. D.*	35	----	----	----	----	5	4	5	4	4	5	4	4
Sutton's Bay, *H. A. Sifton, M. D.*	20	----	----	----	----	----	----	----	3	4	5	4	4
Northern Division*	109	15	12	12	8	10	8	10	8	8	10	4	4
Boyne City, *A. J. DeLacey, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Mackinaw City, *H. P. Smith, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Petoskey, *W. A. S. Williams, M. D.*	44	5	4	4	4	5	4	5	4	4	5	----	----
Northeastern Division*	201	20	15	16	12	19	16	20	16	16	19	16	16
Harrisville, D. W. Mitchell, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Long Rapids, *H. A. Stonex, M. D.*	50	5	4	4	4	4	4	5	4	4	4	4	4
Oscoda, *J. V. White, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Tawas City, *Geo. S. Darling, M. D.*	35	----	----	----	----	5	4	5	4	4	5	4	4
West Branch, *C. F. Cochran, M. D.*	51	5	3	4	4	5	4	5	4	4	5	4	4
Western Division*	454	34	28	27	31	45	35	46	41	44	49	39	35
Berlin, A. E. Shimmel, M. D.	46	5	4	4	4	5	4	5	4	4	4	3	----
Cannonsburg, C. R. Crosby, M. D.	34	----	----	----	----	5	4	4	4	4	5	4	4
Cedar Springs, *C. S. Ford, M. D.*	38	5	4	4	4	5	4	5	3	4	----	----	----
Casnovia, *C. E. Koon, M. D.*	24	----	----	----	----	----	----	3	4	4	5	4	4
Grand Haven, *A. Van der Veen, M. D.*	38	----	----	----	4	5	4	4	4	4	5	4	4
Grand Rapids, A. Hazlewood, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Hart, *A. A. Dunton, Jr. M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Hesperia, *Wm. C. Wells, M. D.*	50	4	4	4	3	5	4	5	4	4	5	4	4
Lowell, A. M. Elsworth, M. D.	51	5	4	3	4	5	4	5	4	4	5	4	4
Ludington, *G. W. Crosby, M. D.*	49	5	4	4	4	5	3	5	3	4	5	4	3
Muskegon, *H. C. Brown, M. D.*	20	----	----	----	----	----	----	----	3	4	5	4	4
Northern Central Division*	228	29	23	20	22	25	20	20	16	14	15	12	12
Big Rapids, *I. W. Badger, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Gladwin, *T. H. Spencer, M. D.*	25	5	3	4	4	5	4	----	----	----	----	----	----
Harrison, *P. E. Witherspoon, M. D.*	9	5	4	----	----	----	----	----	----	----	----	----	----
Harrison, *Henry Thompson, M. D.*	23	----	----	----	3	5	4	5	4	2	----	----	----
Lake City, *D. J. Ervin, M. D.*	16	5	4	4	3	----	----	----	----	----	----	----	----
Morley, C. V. High, M. D.	51	4	4	4	4	5	4	5	4	4	5	4	4
Roscommon, *J. H. Curnalia, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Bay and Eastern Division*	801	65	50	54	51	65	59	85	71	70	91	70	70
Algonac, *W. K. Moore, M. D.*	49	5	3	4	4	5	3	5	4	4	5	4	3
Almont, *A. Price, M. D.*	25	5	4	3	4	5	4	----	----	----	----	----	----
Brown City, *J. A. Watson, M. D.*	40	4	3	2	3	4	3	5	3	3	3	3	4
Capac, *C. E. Ross, M. D.*	51	4	4	4	4	5	4	5	4	4	5	4	4
Columbiaville, *C. A. Wisner, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Croswell, *Howard Carey, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Elba, *Sam. Phelps, M. D.*	16	5	4	4	3	----	----	----	----	----	----	----	----
Essexville, *A. J. Harris, M. D.*	16	5	4	4	3	----	----	----	----	----	----	----	----
Grindstone City, W. J. Herrington, M. D.	32	----	----	2	3	4	3	5	3	4	4	2	2
Port Huron, *W. J. Duff, M. D.*	50	5	4	4	4	5	4	4	4	3	5	4	4
Sand Beach, *H. R. Hitchcock, M. D.*	48	4	4	4	4	5	3	5	3	4	4	4	4

a In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

* For counties in each division see Exhibit I., page 95.

EXHIBIT V.—CONTINUED.

Divisions and localities represented and physicians who reported. (Health Officers in Italics.)	Weekly Reports in 1889, Compiled in this Article.												
	Year, 1889.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division—*Continued:* *													
Saginaw (East), W. L. Dickinson, M. D.	49	5	4	4	4	5	4	5	2	3	5	4	4
Saginaw, *N. D. Lee, M. D.*	35					5	4	5	4	4	5	4	4
Thornville, *J. S. Caulkins, M. D.*	49	5	4	3	3	5	4	5	4	4	5	3	4
Vassar, *J. R. Nunn, M. D.*	51	5	4	4	4	5	4	5	4	3	5	4	4
Zilwaukee, *J. J. Lyon, M. D.*	18	3		4	4	3						2	2
Carsonville, *Allen M. Kay, M. D.*	23							3	4	3	5	4	4
Croswell, *T. S. Kingston, M. D.*	34					4	4	5	4	4	5	4	4
Chesaning, *H. W. Marsh, M. D.*	29						4	5	4	4	5	4	3
Bay City, *H. M. Gale, M. D.*	29						3	5	4	4	5	4	4
Lexington, *W. P. Brown, M. D.*	20								4	3	5	4	4
Marine City, *F. Blagborne, M. D.*	18							5	4	4	5		
Otter Lake, *G. F. Parks, M. D.*	30						4	5	4	4	5	4	4
Yale, *G. S. Ney, M. D.*	24							3	4	4	5	4	4
Central Division *	847	74	58	54	59	97	81	86	64	63	80	67	64
Charlotte, *A. R. Stealy, M. D.*	31					5	3	4	4	4	5	3	3
Durand, *A. G. Cowles, M. D.*	46	4	2	4	3	5	4	5	3	3	5	4	4
Eagle, *H. N. Swaney, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Elsie, *E. Bigham, M. D.*	30	5	4		4	4	4	4				3	3
Fowlerville, *Arthur S. Austin, M. D.*	35					5	4	5	4	4	5	4	4
Fowler, *G. C. Havens, M. D.*	12										4	4	4
Grand Ledge, *W. A. Brower, M. D.*	22					3	4	4	4	4	3		
Hastings, A. P. Drake, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Hastings, *D. E. Fuller, M. D.*	13	5	4	4									
Hastings, *F. R. Timmerman, M. D.*	37				4	5	2	5	4	4	5	4	4
Howard City, James Totten, M. D.	41	5	4	4	4			3	4	4	5	4	4
Howard City, *Sam. E. Morgan, M. D.*	18					5	4	4	3	2			
Howell, J. A. Wessenger, M. D.	50	5	4	4	4	5	4	4	4	4	4	4	4
Hubbardston, *C. S. Park, M. D.*	33					5	4	4	4	4	5	4	3
Kalamo, *L. C. Jones, M. D.*	26	5	4	4	4	5	4						
Lakeview, *A. H. Forsyth, M. D.*	51	5	4	4	4	5	4	5	4	4	5	4	3
Lyons, *B. M. Hutchinson, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Leslie, *Allen C. Manley, M. D.*	15					5	4					2	4
Perry, *E. A. Runyan, M. D.*	26	5	4	4	4	5	4						
Potterville, *L. E. Higby, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Portland, *G. D. Allen, M. D.*	24						4	5	3	3	5	4	
Sheridan, *W. H. Budd, M. D.*	47	5	4	2	4	5	4	4	4	3	4	4	4
Stanton, W. P. Gamber, M. D.	51	5	4	4	4	5	4	5	3	4	5	4	4
Wood's Corners, Geo. Pray, M. D.	31	5	4	4	4	5	4	5					
Southwestern Division *	496	38	28	28	29	53	40	45	44	45	56	47	43
Allegan, *L. F. Stuck, M. D.*	20								4	4	4	4	4
Berrien Springs, *W. F. Bullard, M. D.*	33					5	4	3	4	4	5	4	4
Benton Harbor, *J. Bell, M. D.*	20	5	4	4	3	4							
Cassopolis, *D. G. Sharpe, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Decatur, *G. W. Mahoney, M. D.*	35					5	4	5	4	4	5	4	4
Hartford, *H. C. Maynard, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Lawton, *I. E. Hamilton, M. D.*	29					4	4	3	4	3	4	4	3
Lawrence, *Zell. L. Baldwin, M. D.*	17								4	4	5	4	
New Buffalo, *A. E. Mason, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Niles, *O. P. Horn, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Otsego, *M. Chase, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Otsego, *L. E. Clarke, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Saugatuck, *J. B. Cook, M. D.*	30	3			2	5	4	4		2	3	3	4
Southern Central Division *	843	69	56	53	52	77	67	85	73	73	91	74	73
Augusta, *C. C. Landon, M. D.*	35					5	4	5	4	4	5	4	4
Burr Oak, J. C. Rollman, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Burr Oak, *C. D. Parsons, M. D.*	43	5	4	4			4	5	4	4	5	4	4
Bronson, *Jno. E. Ontwater, M. D.*	19								3	4	5	3	4
Brooklyn, *E. N. Palmer, M. D.*	28					5	4		4	4	4	4	3
Concord, *W. N. Keeler, M. D.*	32					3	4	5	4	3	5	4	4
Coldwater, *L. A. Warsabo, M. D.*	50	5	4	4	4	5	4	5	4	4	5	4	2
Deerfield, *W. M. Wood, M. D.*	38					3	4	5	4	4	5	4	4
Jackson, F. W. Main, M. D.	25	5	4	4	4	4	4						
Jackson, *N. H. Williams, M. D.*	17	5	4	4	4								
Jonesville, *H. M. Warren, M. D.*	45	4	4	2	4	4	4	5	4	3	3	4	4
Kalamazoo, *H. H. Schaberg, M. D.*	46	5	4	4	4	4		5	4	4	5	3	4
Kalamazoo, W. B. Southard, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Litchfield, J. O. Spinning, M. D.	17	5	4	4	4								
Litchfield, *Geo. Martin, M. D.*	51	5	4	3	4	5	4	5	4	4	5	4	4
Mendon, *Edwin Stewart, M. D.*	26							5	4	4	5	4	4

* For counties in each division see Exhibit I., page 95.

EXHIBIT V.—CONTINUED.

Divisions and localities represented and physicians who reported. (Health Officers in Italics.)	Weekly Reports in 1889, Compiled in this Article.												
	Year, 1889.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division—*Continued:* *													
Mendon, H. C. Clapp, M. D.	52	5	4	4	4	5	4	5	4	4	5	4	4
Marshall, *H. L. Joy, M. D.*	14	----	----	----	----	5	4	5	----	----	----	----	----
Richland, *J. M. Rankin, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Sturgis, *S. B. Follett, M. D.*	32	----	----	----	----	4	3	5	4	4	4	4	4
Tecumseh, *J. F. Jenkins, M. D.*	18	----	----	----	----	----	----	----	2	3	5	4	4
Union City, *E. Brumfield, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Vicksburg, *C. H. McKain. M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Southeastern Division *	544	59	43	43	39	48	39	47	41	43	52	44	46
Armada, *S. T. Beardslee, M. D.*	48	5	4	4	4	5	4	5	4	0	5	4	4
Armada, *C. H. Lincoln, M. D.*	49	5	4	4	4	5	4	4	2	4	5	4	4
Detroit, W. H. Rouse, M. D.	17	5	4	4	4	----	----	----	----	----	----	----	----
Farmington, *J. J. Moore, M. D.*	17	5	4	4	4	----	----	----	----	----	----	----	----
Holly, L. E. Wickens, M. D.	51	5	4	4	4	5	3	5	4	4	5	4	4
Memphis, *D. H. Cole, M. D.*	50	5	4	4	3	5	4	5	3	4	5	4	4
New Haven, *Alex. Gunn, M. D.*	52	5	4	4	4	5	4	5	4	4	5	4	4
Northville, *J. M. Swift, M. D.*	50	5	4	4	4	5	4	5	4	3	4	4	4
Plymouth, *J. M. Collier, M. D.*	14	4	----	----	----	----	----	----	4	4	----	----	2
Pontiac, *M. W. Gray, M. D.*	50	5	4	4	4	5	4	3	4	4	5	4	4
Romeo, *Wm. Greenshields, M. D.*	46	5	4	4	----	3	4	5	4	4	5	4	4
Romeo, *J. B. Fares, M. D.*	35	----	----	----	----	5	4	5	4	4	5	4	4
Rochester, *E. P. Ewell, M. D.*	16	----	----	----	----	----	----	----	----	4	4	4	4
Wyandotte, *E. P. Christian, M. D.*	49	5	3	3	4	5	4	5	4	4	4	4	4

* For counties in each division see Exhibit I., page 95.

Foot-notes from page 105.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the 12 months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

[Foot-note from pages 99, 100 and 101.]

‡ Consumption, remittent fever and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1878); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; pleuritis was not printed on any cards used prior to 1888; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—*Stating, for each of the Thirteen Years 1877–1889, and the Average for 1877–1888, by what Per Cent of Observers each of 28 Diseases was reported present in those Years (also the Average Number of Observers per Month and the Total Observers for each Year).—Compiled from Weekly Reports of Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.*—Diseases arranged in order of Greatest Number of Observers reporting them present in 1889.—(Continued, for each month of several of the above mentioned Years, on pages 106–107.)*

Line Number.	Diseases.	Observers by whom the Several Diseases were Reported Present.—Average Per Cents (per Month) of those making Reports.†													
		Av. 1877–88.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av. for tabulated diseases reported present	.....	36	35	37	37	38	42	43	43	45	43	44	39	38
	Neuralgia	81	82	79	83	83	83	84	85	85	78	79	75	.....	.....
2	Rheumatism	83	82	82	82	85	83	83	83	85	84	85	85	81	78
3	Bronchitis	74	75	74	69	71	70	74	79	80	74	77	75	75	71
4	Tonsillitis	58	71	64	68	70	72	73	73	72	65	67	68	.....	.....
5	Diarrhea	64	65	60	65	64	66	71	67	69	67	63	65	57	58
6	Intermittent Fever	80	61	59	64	71	73	79	82	83	90	90	90	90	85
7	Consumption, Pul.	70	59	57	60	64	68	72	71	74	78	76	78	76	.....
8	Influenza	52	49	46	46	48	47	53	56	55	48	54	57	57	54
9	Pneumonia	54	47	49	46	48	44	48	59	61	60	62	60	58	56
10	Remittent Fever	60	45	49	46	48	52	60	57	64	66	67	69	71	68
11	Erysipelas	43	43	44	44	43	44	48	47	42	42	45	43	35	35
12	Inflam. of Kidney	35	35	33	32	35	34	41	.....	.....	.....	.....	.....	.....	.....
13	Dysentery	32	33	30	33	30	28	38	35	31	34	30	31	30	34
14	Pleuritis	.....	33	32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	Inflam. of Bowels	30	29	30	32	32	32	30	31	28	26	25	.....	.....	.....
16	Cholera Morbus	32	27	29	33	29	33	37	32	31	41	34	34	25	26
17	Typho-mal. Fever	33	26	25	26	27	27	32	32	39	43	37	32	35	37
18	Whooping-cough	27	25	16	24	28	21	29	23	26	24	42	31	28	28
19	Cholera Infantum	23	21	20	24	25	21	26	24	22	27	23	23	20	17
20	Scarlet Fever	28	18	17	15	20	22	29	32	32	32	26	36	38	33
21	Typhoid Fever (ent.)	19	17	16	15	15	16	20	19	24	26	21	18	16	22
22	Puerperal Fever	12	13	12	14	12	13	16	15	18	12	8	8	6	10
23	Inflam. of Brain	13	13	13	15	13	14	14	12	12	12	13	.....	.....	.....
24	Measles	20	12	25	22	10	9	17	37	20	37	30	18	7	12
25	Diphtheria	33	12	14	18	24	27	27	31	43	51	43	45	37	32
26	Cer.-spinal Men.	9	7	7	7	8	12	12	11	12	16	6	5	6	6
27	Membranous Croup	13	7	10	10	12	10	14	14	15	19	13	16	14	14
28	Small-pox	1.6	0.5	.07	.01	0.5	0.4	0.2	1	5	4	1	1	1	5
	No. of Observers	135	139	142	155	169	163	142	140	159	116	112	110	97	115
	Av. No. of Observers per month	87	100	102	114	113	104	79	88	98	70	79	73	64	66

* For 1889, the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 98, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 102, 103 and 104.

† ‡ Foot-notes are on preceding page.

TABLE 1.—CONTINUED.—*Per Cent of Observers by whom the Several Diseases were twelve years,

Per Cent of Observers by whom the Diseases were Reported Present.‡

Line Number.	January.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	February.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	March.* Diseases.	Av. '77-'88.	1889.	1888.	1887.
	Average†	41	36	35	38	Average †	40	32	38	38	Average†	41	34	38	39
1	Bronchitis	85	83	77	76	Neuralgia	83	83	83	83	Neuralgia	88	82	88	89
2	Rheumatism	87	83	79	87	Bronchitis	86	80	90	79	Bronchitis	86	81	86	76
3	Neuralgia	84	82	79	87	Rheumatism	85	75	87	83	Rheumatism	86	84	83	85
4	Tonsillitis	79	82	77	74	Tonsillitis	79	75	75	76	Tonsillitis	80	74	79	80
5	Pneumonia	77	66	67	69	Pneumonia	79	69	76	71	Pneumonia	79	65	78	70
6	Consumption Pul.	70	60	56	63	Consumption Pul.	72	61	62	66	Consumption Pul.	74	62	60	69
7	Influenza	67	59	60	56	Influenza	70	57	70	60	Influenza	70	61	68	62
8	Intermittent Fever	71	53	54	59	Intermittent Fever	71	49	57	57	Intermittent Fev.	75	47	61	62
9	Diarrhea	45	52	41	46	Diarrhea	45	42	48	47	Diarrhea	48	47	50	48
10	Erysipelas	48	49	44	45	Pleuritis		37	51		Erysipelas	47	45	47	52
11	Pleuritis		45	40		Erysipelas	46	36	54	49	Inflam. of Kidney	39	42	38	36
12	Remittent Fever	53	40	42	43	Inflam. of Kidney	40	34	43	37	Pleuritis		42	43	
13	Scarlet Fever	35	32	25	21	Remittent Fever	59	33	55	35	Remittent Fever	54	35	46	45
14	Inflam. of Kidney	37	30	34	35	Inflam. of Bowels	26	26	28	28	Whooping-cough	26	25	16	25
15	Inflam. of Bowels	26	28	33	28	Whooping-cough	25	24	17	21	Inflam. of Bowels	30	22	30	33
16	Typho-mal. Fever	28	23	20	20	Typho-mal. Fever	24	19	20	18	Typho-mal. Fever	21	18	13	17
17	Whooping-cough	27	23	14	21	Scarlet Fever	34	19	17	21	Inflam. of Brain	14	15	14	16
18	Dysentery	15	22	14	15	Inflam. of Brain	14	18	15	21	Scarlet Fever	36	15	15	26
19	Diphtheria	40	17	16	26	Dysentery	12	11	13	13	Puerperal Fever	16	11	17	20
20	Puerperal Fever	12	14	11	11	Puerperal Fever	12	10	16	13	Dysentery	16	11	14	21
21	Membran. Croup	24	13	13	22	Membran. Croup	18	10	11	13	Diphtheria	33	11	16	20
22	Typhoid Fev.(ent.)	18	12	14	10	Measles	22	9	33	26	Cerebro-spi. Men.	11	11	9	7
23	Measles	19	11	31	18	Cerebro-spi. Men.	9	8	8	8	Membran. Croup	17	10	15	10
24	Inflam. of Brain	13	10	15	20	Diphtheria	36	7	21	19	Measles	28	8	44	37
25	Cholera Morbus	10	8	8	10	Typhoid Fev.(ent.)	14	7	15	13	Typhoid Fev.(ent.)	12	4	11	7
26	Cerebro-spi. Men.	7	5	5	7	Cholera Morbus	10	4	7	9	Cholera Infantum	5	2	4	3
27	Cholera Infantum	5	3	2	8	Cholera Infantum	4	4	2	8	Cholera Morbus	13	2	11	9
28	Small-pox	2	2	1	0	Small-pox	2	1	1	0	Small-pox	1	0	1	0
	Observers§	84	92	91	100	Observers §	84	89	87	98	Observers §	83	89	98	89

Line Number.	April.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	May.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	June.* Diseases.	Av. '77-'88.	1889.	1888.	1887.
	Average †	41	34	38	37	Average †	40	38	34	38	Average †	39	33	37	37
1	Rheumatism	88	87	89	86	Rheumatism	86	87	85	84	Rheumatism	84	85	86	81
2	Neuralgia	86	86	84	84	Neuralgia	82	83	75	82	Neuralgia	80	80	82	83
3	Bronchitis	82	81	79	75	Bronchitis	77	83	74	70	Bronchitis	69	71	75	72
4	Tonsillitis	74	77	72	76	Tonsillitis	70	75	55	63	Tonsillitis	64	66	67	69
5	Influenza	63	64	55	55	Intermittent Fev.	84	63	59	69	Diarrhea	65	64	49	48
6	Consumption Pul.	73	58	57	67	Diarrhea	55	63	55	77	Intermittent Fever	84	63	62	71
7	Pneumonia	74	55	68	64	Consumption Pul.	73	60	66	56	Consumption Pul.	69	59	62	61
8	Erysipelas	48	51	50	52	Pneumonia	63	56	44	34	Erysipelas	43	44	48	46
9	Intermittent Fever	80	50	57	65	Influenza	53	54	35	40	Inflam. of Kidney	37	42	39	34
10	Remittent Fever	56	48	43	41	Erysipelas	48	48	45	44	Influenza	40	36	43	50
11	Diarrhea	50	48	47	49	Remittent Fever	59	41	47	44	Remittent Fever	60	35	50	48
12	Pleuritis		42	41		Inflam. of Kidney	37	38	34	37	Pneumonia	44	34	64	58
13	Inflam. of Kidney	39	33	38	33	Pleuritis		34	26		Pleuritis		27	37	
14	Wooping-cough	25	31	19	24	Whooping-cough	28	29	17	27	Whooping-cough	27	24	22	26
15	Inflam. of Bowels	26	19	28	27	Inflam. of Bowels	28	29	23	36	Inflam. of Bowels	29	22	31	30
16	Typho-mal. Fever	20	19	21	21	Scarlet Fever	29	23	13	9	Cholera Morbus	39	20	19	27
17	Inflam. of Brain	15	17	13	11	Dysentery	18	23	15	30	Measles	32	18	57	41
18	Scarlet Fever	33	17	35	14	Measles	39	21	44	29	Scarlet Fever	25	17	22	10
19	Measles	34	13	50	38	Typho-mal. Fev.	21	19	17	17	Typho-mal. Fever	22	14	22	14
20	Dysentery	15	12	16	12	Puerperal Fever	12	17	8	17	Dysentery	25	14	21	20
21	Puerperal Fever	12	10	15	16	Cholera Morbus	20	17	29	52	Inflam. of Brain	13	12	10	15
22	Diphtheria	31	8	18	9	Inflam. of Brain	13	15	11	21	Puerperal Fever	13	10	14	9
23	Membran. Croup	14	8	16	15	Diphtheria	27	12	10	13	Typhoid Fev.(ent.)	10	10	8	5
24	Cholera Morbus	14	7	13	11	Cerebro-spi. Men.	10	11	7	10	Cholera Infantum	23	10	9	13
25	Cerebro-spi. Men.	12	5	9	7	Membran. Croup	11	7	6	4	Diphtheria	25	10	14	12
26	Cholera Infantum	5	3	4	5	Typhoid Fev.(ent.)	9	6	7	9	Membran. Croup	8	3	14	10
27	Typhoid Fev.(ent.)	10	3	9	5	Cholera Infantum	9	5	19	26	Cerebro-spi. Men.	9	3	6	10
28	Small-pox	2	1	0	0	Small-pox	3	0	0	0	Small-pox	2	0	1	0
	Observers§	77	86	96	85	Observers §	83	102	102	100	Observers§	86	103	100	108

*For 1889 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 98, the names of observers and the number of reports received from each are *stated in Exhibit V., pages 102-3-4.* † The numbers in this line are an average, not for all diseases repre*sented, but only for those reported* present in the given month. ‡See foot-note with this mark on page 104. *The numbers in this line state how many* observers reported for the month in given year. * For first page *of Table 1, and full heading,* see page 102.

Reported Present by Months in each of Years 1887-1889, and the Average for the 1877-1888.

Per Cent of Observers by whom the Diseases were Reported Present.‡

July.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	August.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	September.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	Line Number.
Average†	41	40	34	39	Average†	43	41	39	44	Average†	44	40	37	38	
Diarrhea	90	89	83	94	Diarrhea	96	96	92	96	Diarrhea	94	86	86	86	1
Rheumatism	78	85	75	76	Cholera Morbus	77	83	75	78	Neuralgia	75	82	64	85	2
Neuralgia	78	81	78	79	Dysentery	75	82	76	80	Rheumatism	76	75	78	75	3
Bronchitis	58	70	54	55	Neuralgia	75	76	78	82	Dysentery	70	73	67	58	4
Intermittent Fev.	85	67	59	65	Rheumatism	74	74	72	81	Intermittent Fever	86	65	62	70	5
Cholera Morbus	70	60	59	76	Intermittent Fever	86	69	62	71	Bronchitis	62	65	66	59	6
Tonsillitis	53	59	43	45	Bronchitis	56	66	63	55	Cholera Morbus	64	63	59	55	7
Consumption Pul.	67	57	57	56	Tonsillitis	53	66	44	56	Cholera Infantum	57	59	52	39	8
Remittent Fever	63	53	41	44	Cholera Infantum	67	65	62	73	Consumption Pul.	64	57	50	51	9
Dysentery	52	50	49	65	Consumption Pul.	65	57	59	61	Tonsillitis	59	54	50	56	10
Cholera Infantum	49	49	42	65	Remittent Fever	69	52	62	55	Remittent Fever	71	53	56	55	11
Inflam. of Kidney	31	45	28	24	Erysipelas	36	39	38	39	Typho-mal. Fever	55	45	42	49	12
Erysipelas	40	40	33	35	Typho-mal. Fever	40	37	27	43	Erysipelas	32	41	31	33	13
Inflam. of Bowels	35	36	38	37	Influenza	32	31	24	33	Inflam. of Kidney	25	32	19	23	14
Whooping-cough	30	32	13	33	Inflam. of Bowels	37	31	33	48	Influenza	42	31	32	40	15
Influenza	30	31	22	24	Inflam. of Kidney	31	30	32	28	Whooping-cough	28	31	16	20	16
Pleuritis	...	30	16	...	Pneumonia	25	27	25	19	Inflam. of Bowels	31	31	28	33	17
Pneumonia	30	27	26	21	Whooping-cough	30	25	15	32	Typhoid Fev.(ent.)	31	29	28	32	18
Typho-mal. Fever	26	21	13	22	Typhoid Fev.(ent.)	24	21	23	27	Pneumonia	31	27	27	28	19
Scarlet Fever	21	15	11	5	Pleuritis	...	20	20	...	Pleuritis	...	25	18	...	20
Measles	23	14	18	24	Inflam. of Brain	16	14	16	14	Diphtheria	29	15	16	14	21
Puerperal Fever	11	13	11	12	Cerebro-spi. Men.	9	11	7	8	Inflam. of Brain	12	14	11	10	22
Typhoid Fev.(ent.)	13	13	16	11	Scarlet Fever	19	10	7	12	Puerperal Fever	11	9	10	16	23
Inflam. of Brain	13	12	11	14	Puerperal Fever	12	9	12	16	Scarlet Fever	20	9	12	13	24
Cerebro-spi. Men.	9	7	5	8	Diphtheria	26	9	15	13	Measles	8	7	8	8	25
Diphtheria	25	6	8	13	Measles	12	7	9	11	Cerebro-spi. Men.	9	6	6	4	26
Membran. Croup	4	5	2	2	Membran. Croup	5	4	4	4	Membran. Croup	9	5	4	5	27
Small-pox	2	0	0	0	Small-pox	1	0	0	0	Small-pox	1	0	0	1	28
Observers§	90	103	109	110	Observers§	92	109	110	108	Observers§	90	110	109	105	

October.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	November.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	December.* Diseases.	Av. '77-'88.	1889.	1888.	1887.	Line Number.
Average†	43	42	38	37	Average†	40	35	32	39	Average†	40	34	33	35	
Rheumatism	83	84	87	82	Neuralgia	82	86	76	84	Neuralgia	84	84	78	80	1
Diarrhea	76	83	63	69	Rheumatism	85	84	82	86	Rheumatism	86	81	83	85	2
Neuralgia	81	82	83	83	Bronchitis	78	78	72	76	Bronchitis	82	78	80	76	3
Tonsillitis	68	76	64	70	Tonsillitis	76	77	76	81	Tonsillitis	80	77	72	79	4
Bronchitis	79	75	74	69	Intermittent Fever	78	61	57	62	Influenza	59	68	52	51	5
Intermittent Fever	84	66	67	64	Diarrhea	56	58	50	58	Consumption Pul.	69	63	57	56	6
Consumption Pul.	69	63	51	58	Consumption Pul.	69	57	52	63	Intermittent Fever	72	57	51	54	7
Remittent Fever	68	61	58	54	Pneumonia	54	47	43	53	Pneumonia	65	49	50	48	8
Influenza	46	55	44	39	Remittent Fever	60	45	43	45	Diarrhea	47	43	42	49	9
Pneumonia	39	50	39	31	Influenza	55	44	48	53	Remittent Fever	56	40	45	47	10
Typho-mal. Fever	56	49	50	41	Erysipelas	41	44	42	57	Pleuritis	...	37	38	...	11
Dysentery	45	46	36	32	Typhoid Fev.(ent.)	29	35	19	22	Erysipelas	43	37	50	44	12
Erysipelas	41	42	46	42	Pleuritis	...	31	30	...	Inflam. of Bowels	28	34	26	30	13
Typhoid Fev.(ent.)	34	36	29	26	Inflam. of Kidney	33	30	28	34	Inflam. of Kidney	35	32	32	29	14
Inflam. of Bowels	30	35	31	24	Inflam. of Bowels	27	30	26	26	Scarlet Fever	30	29	25	22	15
Inflam. of Kidney	35	35	30	38	Dysentery	23	24	19	19	Typho-mal. Fever	33	19	25	12	16
Cholera Morbus	32	29	27	23	Typho-mal. Fever	44	22	33	28	Diphtheria	39	17	12	22	17
Pleuritis	...	26	32	...	Scarlet Fever	26	17	17	18	Whooping-cough	25	16	18	22	18
Whooping-cough	26	24	17	20	Diphtheria	40	16	10	33	Typhoid Fev.(ent.)	22	16	14	16	19
Cholera Infantum	25	23	19	13	Whooping-cough	25	15	13	20	Measles	14	16	4	18	20
Diphtheria	38	21	14	25	Puerperal Fever	11	15	9	12	Dysentery	15	16	9	19	21
Scarlet Fever	25	19	16	16	Measles	10	13	6	16	Inflam. of Brain	12	15	12	18	22
Puerperal Fever	11	19	11	10	Inflam. of Brain	11	12	14	9	Purperal Fever	11	13	8	11	23
Inflam. of Brain	11	14	11	12	Cholera Morbus	15	7	14	16	Membran. Croup	20	11	12	14	24
Membran. Croup	14	10	14	11	Membran. Croup	19	6	8	19	Cholera Morbus	13	7	10	12	25
Measles	8	8	10	10	Cholera Infantum	10	6	8	8	Cerebro-spi. Men.	7	4	5	4	26
Cerebro-spi. Men.	9	5	6	5	Cerebro-spi. Men.	7	5	6	6	Cholera Infantum	5	3	6	5	27
Small-pox	1	0	0	0	Small-pox	1	1	2	0	Small-pox	2	1	2	0	28
Observers§	89	107	105	100	Observers§	87	109	105	97	Observers§	86	104	109	94	

*, †, ‡. See notes with these marks on page 106.
§ For this foot-note see page 106.

TABLE 2.--WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1889.—*Exhibiting for the Year and for each Month of the Year Ending Saturday, December 28, 1889, a Summary relative to diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 11 Geographical Divisions* of the State.—Indicating the prevalence as regards Time and Area. Compiled from 5,000 Weekly Reports by 137 Observers. Health Officers of Cities and Villages, Regular Correspondents of the State Board of Health, and other Physicians, Reporting the Diseases under their observation.*

Number of Observers, Reports, Etc.	Diseases.	(Av. b) Per Cent of Observers reporting Presence of.	Average Per Cent of Weeks reported Present. c	Per Cent of Reports Stating Presence of. d	Average Order of Prevalence where Present. e	Average Order of Prevalence where Present.												
						1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	Av. 1877-1888.
Year Ending December 28, 1889,† represented, 124. Whole number of Observers during the year, 137. Average number of localities represented per month, 100. Total number of reports compiled per month, 417. 5,000.	Average for tabulated diseases reported present.	36	64	23	3.3	3.5	3.7	3.7	3.8	4.2	4.2	4.2	4.9	4.7	4.7	4.4	4.1	.....
	Brain, Inflammation of	13	39	5	4.8	6.4	6.2	5.9	6.0	6.4	6.6	6.6	8.7	8.1	.....	.....	.....	.....
	Bowels, Inflammation of	29	47	14	4.1	4.6	5.0	5.0	5.1	5.8	6.1	6.0	7.4	7.0	.....	.....	.....	.....
	Bronchitis	75	76	58	2.7	2.7	3.0	3.0	3.1	3.2	3.2	3.3	3.9	3.7	3.6	3.3	2.3	3.2
	Cerebro-spinal Meningitis	7	39	3	4.2	4.6	7.8	7.3	6.9	6.9	7.4	7.2	7.9	7.1	7.4	5.9	6.0	6.9
	Cholera Infantum	21	53	11	3.4	4.0	4.1	3.9	4.6	4.8	4.8	4.9	5.1	5.2	5.4	5.7	4.9	4.8
	Cholera Morbus	27	58	14	3.4	3.7	3.8	4.2	4.5	4.9	5.0	5.2	5.3	5.3	5.3	5.7	4.7	4.8
	Consumption, Pulmonary	59	81	48	3.5	3.6	3.7	3.9	4.0	4.3	4.5	4.6	5.6	5.7	5.6	5.2	5.1	4.7
	Croup, Membranous	7	35	3	4.3	5.1	6.8	6.2	6.1	7.1	7.1	7.0	8.2	7.4	6.6	7.1	6.1	6.7
	Diphtheria	12	49	6	4.3	4.8	4.4	4.2	4.7	5.1	5.4	4.8	5.6	5.7	5.4	5.4	5.3	5.1
	Diarrhea	65	68	45	2.8	3.0	3.0	3.2	3.3	3.3	3.7	3.8	3.9	4.2	4.4	4.2	3.8	3.7
	Dysentery	38	52	17	3.7	3.8	4.3	4.5	5.0	5.0	5.2	5.3	5.1	5.8	6.2	5.9	4.9	5.1
	Erysipelas	43	50	22	4.1	4.4	4.7	4.5	4.6	5.2	5.5	5.5	6.2	6.3	6.5	6.4	5.8	5.5
	Fever, Intermittent	61	71	43	2.6	2.6	2.8	2.6	2.4	2.5	2.3	2.0	2.4	2.3	2.2	2.1	2.2	2.4
	Fever, Remittent	45	66	30	3.2	3.1	3.4	3.3	3.2	3.3	3.3	3.3	3.5	3.3	3.3	3.1	3.1	3.3
	Fever, Typhoid (Enteric)	17	61	10	3.9	4.2	4.5	4.7	4.7	5.2	5.1	5.1	6.2	6.5	7.0	7.0	5.5	5.5
	Fever, Typho-malarial	26	61	16	3.9	3.6	4.1	4.2	4.4	4.6	4.8	4.9	5.2	5.5	5.3	5.4	4.7	4.8

For the Whole number of localities sented per month, 94. nge number of observers Average No. of Reports

Influenza	49	65	32	2.4	2.7	3.0	2.7	2.9	3.3	3.2	3.1	3.5	3.0	3.1	3.1	3.0	3.1
Kidney, Inflammation of	35	58	20	4.1	4.5	4.9	4.7	4.4	5.0								
Measles	12	50	6	3.5	3.2	3.6	5.0	6.4	5.2	3.7	4.9	4.4	4.8	4.7	5.3	5.0	4.7
Neuralgia	82	76	63	2.6	2.7	2.8	2.8	2.8	3.3	3.3	3.6	4.3	4.5	4.5			
Pleuritis	38	51	17	4.0	4.4												
Pneumonia	47	56	26	3.7	4.0	4.3	4.0	4.4	4.5	4.7	4.4	5.4	5.1	5.2	4.8	4.0	4.6
Puerperal Fever	13	39	5	3.4	4.6	5.7	5.9	6.3	6.9	7.3	6.2	8.2	7.8	7.2	6.3	6.1	6.5
Rheumatism	82	79	65	2.8	3.0	3.2	3.2	3.2	3.6	3.7	3.8	4.6	4.6	4.6	4.2	4.0	3.8
Scarlatina	18	54	10	3.9	4.6	5.0	4.5	5.0	5.2	5.2	4.9	6.7	6.5	5.5	5.4	4.8	5.3
Small-pox	0.5	62	.03	11.0	1.53	26.0	25.9	8.4	26.0	14.0	9.1	8.9	6.3	10.6	3.9	6.8	12.3
Tonsillitis	71	65	46	3.3	3.4	3.4	3.4	3.5	3.7	3.9	3.9	4.5	4.4	4.5			
Whooping-cough	25	64	16	3.3	3.9	4.2	3.7	4.1	4.5	5.2	4.4	6.3	5.5	4.7	4.8	5.1	4.7

* For counties in each Division, see Exhibit I., page 95.

† For number of Observers, reports, weeks in each month, etc., see Exhibit III., page 98; for names of observers, and number of reports received from each, see Exhibit V., pages 102, 103 and 104.

a Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

b The numbers in this column (pages 108–9,) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 110 and 111 the numbers in the "Per Cent of Observers" column are statements for the month, and not averages. This column indicates the Area of Prevalence except that in a few instances there were two or more observers in one city or village.

c This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the diseases present. It is therefore an average, not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases" it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or Division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

e The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in Table 3 (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

TABLE 2.—CONTINUED.—*Diseases in the State, 1889.* (*For foot-notes and full tabular heads, see pages 108–109.*)

Month. †	Diseases.	Per ct. of Observers Reporting Pres. of, b	Av. Per ct. of Weeks Reported Present, where present, a, c	Per cent of Reports stating Pres. of, d	Av. order of Prevalence where Pres. e
	Av. for Tab. Dis. Rep. Pres.	36	64	23	3.3
January. †	Brain, Inflammation of	10	42	4	4.6
	Bowels, Inflammation of	28	36	10	4.2
	Bronchitis	83	79	65	2.2
	Cerebro-spinal Meningitis	5	20	1	2.0
	Cholera Infantum	3	54	2	4.0
	Cholera Morbus	8	27	2	3.0
	Consumption, Pulmonary	60	81	49	3.2
	Croup, Membranous	13	36	5	3.8
	Diphtheria	17	52	9	4.8
	Diarrhea	52	52	27	3.7
	Dysentery	22	37	8	4.6
	Erysipelas	49	51	25	3.8
	Fever, Intermittent	53	68	36	2.9
	Fever, Remittent	40	66	26	3.2
	Fever, Typhoid (Enteric)	12	61	8	5.5
	Fever, Typho-malarial	23	53	12	3.9
	Influenza	59	71	42	2.3
	Kidney, Inflammation of	30	62	19	4.6
	Measles	11	47	5	3.3
	Neuralgia	82	79	64	2.5
	Pleuritis	45	51	23	4.0
	Pneumonia	66	61	41	3.4
	Puerperal Fever	14	41	6	2.8
	Rheumatism	83	79	66	2.7
	Scarlatina	32	60	19	3.5
	Small-pox	2	80	2	11.5
	Tonsillitis	82	67	55	3.1
	Whooping-cough	23	62	14	3.9
February. †	Av. for Tab. Dis. Rep. Pres.	32	67	22	3.4
	Brain, Inflammation of	11	30	3	5.5
	Bowels, Inflammation of	2	25	1	2.0
	Bronchitis	2	25	1	3.0
	Cerebro-spinal Meningitis	5	69	3	6.0
	Cholera Infantum	3	27	1	3.0
	Cholera Morbus	7	55	4	8.0
	Consumption, Pulmonary	58	85	50	3.7
	Croup, Membranous	8	37	3	5.3
	Diphtheria	8	58	5	3.3
	Diarrhea	43	66	29	4.2
	Dysentery	12	46	6	5.3
	Erysipelas	51	54	28	4.5
	Fever, Intermittent	50	78	48	3.8
	Fever, Remittent	43	70	30	3.6
	Fever, Typhoid (Enteric)	3	67	3	6.7
	Fever, Typho-malarial	19	69	13	5.6
	Influenza	64	77	50	2.3
	Kidney, Inflammation of	33	63	21	4.7
	Measles	13	55	7	4.3
	Neuralgia	86	81	70	2.6
	Pleuritis	42	57	24	4.5
	Pneumonia	55	68	38	4.0
	Puerperal Fever	10	44	5	3.4
	Rheumatism	87	81	71	3.0
	Scarlatina	17	67	12	4.2
	Small-pox	1	25	0.3	19.0
	Tonsillitis	77	67	52	3.4
	Whooping-cough	31	65	21	4.1
March. †	Av. for Tab. Dis. Rep. Pres.	34	69	24	3.5
	Brain, Inflammation of	15	38	6	5.5
	Bowels, Inflammation of	22	44	10	4.5
	Bronchitis	81	85	69	2.1
	Cerebro-spinal Meningitis	11	30	3	5.5
	Cholera Infantum	2	25	1	2.0
	Cholera Morbus	2	25	1	3.0
	Consumption, Pulmonary	62	80	50	3.5
	Croup, Membranous	10	39	4	3.6
	Diphtheria	11	48	6	4.9
	Diarrhea	47	60	29	3.9
	Dysentery	11	40	5	4.8
	Erysipelas	45	60	27	4.7
	Fever, Intermittent	47	74	34	3.2
	Fever, Remittent	35	71	24	3.6
	Fever, Typhoid (Enteric)	4	64	3	7.8
	Fever, Typho-malarial	18	53	10	4.8
	Influenza	61	79	48	2.3
	Kidney, Inflammation of	42	51	22	4.5
	Measles	8	52	4	5.0
	Neuralgia	82	77	63	2.4
	Pleuritis	42	64	27	4.5
	Pneumonia	65	68	44	3.5
	Puerperal Fever	11	43	5	2.9
	Rheumatism	81	80	66	2.9
	Scarlatina	15	62	9	5.6
	Small-pox	0	0	0	0
	Tonsillitis	74	73	54	3.3
	Whooping-cough	25	74	19	3.7
April. †	Av. for Tab. Dis. Rep. Pres.	34	70	23	3.6
	Brain, Inflammation of	17	41	7	3.9
	Bowels, Inflammation of	19	43	8	4.3
	Bronchitis	81	83	68	2.4
	Cerebro-spinal Meningitis	5	69	3	6.0
	Cholera Infantum	3	27	1	3.0
	Cholera Morbus	7	55	4	8.0
	Consumption, Pulmonary	58	85	50	3.7
	Croup, Membranous	8	37	3	5.3
	Diphtheria	8	58	5	3.3
	Diarrhea	43	66	29	4.2
	Dysentery	12	46	6	5.3
	Erysipelas	51	54	28	4.5
	Fever, Intermittent	50	78	48	3.8
	Fever, Remittent	43	70	30	3.6
	Fever, Typhoid (Enteric)	3	67	3	6.7
	Fever, Typho-malarial	19	69	13	5.6
	Influenza	64	77	50	2.3
	Kidney, Inflammation of	33	63	21	4.7
	Measles	13	55	7	4.3
	Neuralgia	86	81	70	2.6
	Pleuritis	42	57	24	4.5
	Pneumonia	55	68	38	4.0
	Puerperal Fever	10	44	5	3.4
	Rheumatism	87	81	71	3.0
	Scarlatina	17	67	12	4.2
	Small-pox	1	25	0.3	19.0
	Tonsillitis	77	67	52	3.4
	Whooping-cough	31	65	21	4.1
May. †	Av. for Tab. Dis. Rep. Pres.	38	60	23	3.2
	Brain, Inflammation of	15	35	5	4.4
	Bowels, Inflammation of	29	41	13	3.8
	Bronchitis	83	74	61	2.5
	Cerebro-spinal Meningitis	11	40	4	4.8
	Cholera Infantum	5	23	1	5.6
	Cholera Morbus	17	29	5	3.8
	Consumption, Pulmonary	60	77	46	3.7
	Croup, Membranous	7	24	2	4.6
	Diphtheria	12	39	5	4.2
	Diarrhea	63	52	33	3.0
	Dysentery	23	33	7	4.7
	Erysipelas	48	44	21	3.9
	Fever, Intermittent	63	65	41	2.4
	Fever, Remittent	41	52	22	3.0
	Fever, Typhoid (Enteric)	6	69	4	5.2
	Fever, Typho-malarial	19	51	9	4.4
	Influenza	54	63	34	2.3
	Kidney, Inflammation of	38	58	22	3.9
	Measles	21	49	10	3.5
	Neuralgia	83	78	65	2.3
	Pleuritis	34	49	17	3.5
	Pneumonia	56	51	29	3.9
	Puerperal Fever	17	27	5	3.1
	Rheumatism	87	80	70	2.4
	Scarlatina	23	57	13	3.5
	Small-pox	0	0	0	0
	Tonsillitis	75	61	46	3.1
	Whooping-cough	29	70	19	2.5
June. †	Av. for Tab. Dis. Rep. Pres.	33	64	21	2.9
	Brain, Inflammation of	12	40	5	3.8
	Bowels, Inflammation of	22	49	11	3.9
	Bronchitis	71	73	50	2.7
	Cerebro-spinal Meningitis	3	33	1	4.3
	Cholera Infantum	10	38	4	3.2
	Cholera Morbus	20	40	8	3.4
	Consumption, Pulmonary	59	81	47	3.1
	Croup, Membranous	3	33	1	2.0
	Diphtheria	10	38	4	4.7
	Diarrhea	64	58	37	2.9
	Dysentery	14	43	6	3.4
	Erysipelas	44	51	22	3.5
	Fever, Intermittent	63	70	44	2.1
	Fever, Remittent	35	70	25	2.7
	Fever, Typhoid (Enteric)	10	51	5	2.7
	Fever, Typho-malarial	14	62	8	3.2
	Influenza	36	63	22	2.7
	Kidney, Inflammation of	42	63	26	3.6
	Measles	18	59	11	3.1
	Neuralgia	80	80	63	2.3
	Pleuritis	27	51	14	4.0
	Pneumonia	34	46	16	3.5
	Puerperal Fever	10	44	4	3.4
	Rheumatism	85	81	69	2.4
	Scarlatina	17	50	9	3.1
	Small-pox	0	0	0	0
	Tonsillitis	66	60	39	2.9
	Whooping-cough	24	65	15	2.4

Av. for Tab. Dis. Rep. Pres.	July. †				August. †				September. †				October. †				November. †				December. †			
	40	60	24	3.1	41	66	27	3.4	40	68	28	3.5	42	62	26	3.3	85	65	23	3.1	84	66	22	3.2
Brain, Inflammation of	12	30	3	4.1	14	39	5	6.0	14	38	5	5.9	14	40	6	4.4	12	42	5	4.7	15	41	6	4.6
Bowels, Inflammation of	86	50	17	3.5	31	60	19	4.6	31	52	17	4.3	75	52	30	4.0	80	45	14	4.0	34	48	16	4.2
Bronchitis	70	71	49	2.9	66	67	44	3.7	65	77	51	3.5	75	71	57	2.9	78	78	64	2.6	78	80	62	2.3
Cerebro-spinal Meningitis	7	27	2	3.6	11	44	5	4.3	6	56	4	4.4	5	43	2	3.6	5	40	2	3.4	4	44	2	2.5
Cholera Infantum	49	49	23	3.1	65	67	44	3.2	59	66	40	3.4	83	60	7	4.0	6	31	2	5.0	3	40	1	5.7
Cholera Morbus	60	53	32	3.2	83	70	58	3.1	63	61	40	3.6	39	38	11	3.7	16	30	2	3.0	7	32	2	8.9
Consumption, Pulmonary	57	88	47	3.3	57	81	49	3.8	57	83	50	3.8	63	82	52	3.5	57	84	49	3.6	63	81	51	3.2
Croup, Membranous	5	33	1	4.0	4	38	1	2.8	5	57	2	3.8	10	37	4	5.1	6	50	3	4.0	11	40	4	4.9
Diphtheria	6	48	3	4.2	9	41	4	3.9	15	44	7	4.8	21	52	11	3.5	16	54	8	4.0	17	52	9	4.2
Diarrhea	89	76	68	2.2	96	89	85	1.8	86	87	77	1.7	83	67	56	2.9	58	59	34	3.4	43	62	27	3.4
Dysentery	50	47	23	3.5	82	67	55	3.2	78	69	51	3.4	46	44	30	3.9	24	45	11	3.7	16	37	6	4.4
Erysipelas	40	45	18	3.8	39	51	30	4.6	41	41	17	3.9	42	44	15	4.1	44	50	22	3.9	37	61	23	3.8
Fever, Intermittent	67	74	50	2.8	69	74	51	2.5	65	70	50	2.8	66	71	47	2.3	61	68	42	2.4	57	68	39	2.6
Fever, Remittent	53	55	30	3.0	52	70	35	3.2	53	75	41	3.1	61	69	42	2.9	45	65	30	2.8	40	65	36	3.4
Fever, Typhoid (Enteric)	13	42	5	3.5	21	54	12	4.8	29	62	19	4.0	36	70	25	3.3	35	53	19	3.1	16	69	12	3.5
Fever, Typho-malarial	21	50	11	4.0	37	60	32	4.8	45	68	31	3.5	49	67	39	3.3	22	67	15	3.7	19	60	12	4.1
Influenza	31	51	16	2.5	31	50	16	3.2	31	65	21	3.0	55	60	33	2.6	44	66	30	2.1	65	54	37	1.9
Kidney, Inflammation of	45	56	25	3.9	30	57	17	4.4	32	58	19	4.5	35	49	17	4.1	30	61	19	3.7	32	61	19	4.1
Measles	14	47	7	3.2	7	45	3	3.6	7	45	3	3.4	8	48	4	3.0	13	46	6	3.5	16	53	9	3.7
Neuralgia	81	75	60	2.7	76	71	55	3.4	82	70	58	3.2	82	72	60	2.6	86	75	66	2.4	84	58	60	2.4
Pleuritis	30	39	12	3.5	20	49	10	3.8	25	43	11	4.9	26	50	13	4.2	31	56	17	3.6	37	48	17	3.8
Pneumonia	27	39	11	3.6	27	46	12	4.8	37	42	13	4.5	50	47	23	3.7	47	61	29	3.5	49	56	27	3.8
Puerperal Fever	13	29	4	3.2	9	44	4	3.7	9	45	4	4.7	9	42	5	4.1	15	87	5	3.5	13	38	5	4.1
Rheumatism	85	75	64	2.5	74	75	56	3.4	75	80	60	3.2	77	77	65	3.0	84	75	64	2.8	81	55	67	2.6
Scarlatina	15	45	7	3.2	10	40	4	3.5	9	40	4	4.7	19	53	11	3.7	17	56	10	4.3	20	46	9	3.9
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	25	0.2	2.0	1	75	1	2.0
Tonsilitis	59	52	31	3.7	66	51	34	4.1	54	68	35	3.8	76	62	47	3.2	77	74	58	3.9	77	74	57	2.9
Whooping-cough	32	85	18	2.8	25	63	15	2.9	31	56	15	3.0	24	59	15	4.0	15	72	10	3.4	16	73	12	3.5

TABLE 2.—CONTINUED.—*Diseases in the Upper Peninsular, the Northwestern, the Northern, and the Northeastern Divisions of the State for the years 1877–1888, and by Months in 1889.—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.* [d]

Div.*	Diseases.	1877–88.‡	1889. †	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Upper Peninsular Division.*	Av. for Tab. Dis. Rep. Pres...	30	23	26	27	26	36	26	28	30	30	30	27	26	20
	Brain, Inflammation of	8	7	20	4	13	25	3	7	3	0	4	9	7	0
	Bowels, Inflammation of	19	11	20	13	13	6	6	11	6	13	21	12	0	8
	Bronchitis	75	75	83	91	88	100	88	75	55	53	57	76	86	75
	Cerebro-spinal Meningitis	3	4	7	0	4	0	3	0	3	16	0	0	10	4
	Cholera Infantum	13	14	17	4	8	0	3	14	39	38	25	3	0	0
	Cholera Morbus	20	27	17	13	8	6	14	25	48	78	64	18	3	4
	Consumption, Pulmonary	71	32	43	61	29	31	17	43	27	16	29	35	31	33
	Croup, Membranous	6	3	7	0	4	0	0	0	0	9	7	0	0	4
	Diphtheria	9	15	33	17	21	0	11	7	21	19	14	18	7	4
	Diarrhea	62	66	57	52	29	75	58	82	94	88	93	79	48	21
	Dysentery	24	20	13	4	8	6	11	7	18	56	50	15	21	13
	Erysipelas	24	15	13	13	25	0	22	11	6	16	18	24	10	17
	Fever, Intermittent	9	4	7	17	13	0	0	7	0	0	0	6	3	4
	Fever, Remittent	13	4	10	9	0	0	0	4	6	0	7	12	0	0
	Fever, Typhoid (Enteric)	29	26	3	0	0	0	11	4	18	34	57	71	52	33
	Fever, Typho-malarial	4	2	0	0	0	0	0	0	0	13	4	3	0	0
	Influenza	43	20	33	22	29	38	14	11	12	9	14	18	21	29
	Kidney, Inflammation of	44	23	20	17	25	6	17	39	45	16	29	24	17	13
	Measles	19	2	7	0	0	0	3	0	0	3	4	3	3	4
	Neuralgia	56	63	70	52	58	94	69	79	64	59	46	68	59	46
	Pleuritis	....	21	20	13	21	13	14	25	15	22	32	21	31	21
	Pneumonia	39	21	40	22	17	25	39	14	0	6	7	32	21	25
	Puerperal Fever	6	2	3	0	0	0	6	4	0	0	0	0	7	8
	Rheumatism	65	50	50	48	50	56	69	79	52	47	43	29	45	38
	Scarlatina	25	17	33	22	13	13	33	25	24	6	7	15	0	0
	Small-pox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	48	57	57	65	75	69	67	50	58	56	46	50	59	38
	Whooping-cough	23	17	3	17	25	19	22	14	15	22	36	12	7	8

Div.*	Diseases.	1877–88.	1889.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northwestern Division.*	Av. for Tab. Dis. Rep. Pres...	32	26	45	39	40	42	29	33	30	37	33	31	36	28
	Brain, Inflammation of	4	14	7	0	17	27	30	0	10	9	17	13	33	8
	Bowels, Inflammation of	8	23	0	8	17	0	30	0	40	36	33	27	50	33
	Bronchitis	59	60	67	67	67	64	50	38	60	55	58	53	67	75
	Cerebro-spinal Meningitis	2	2	0	0	8	0	0	13	0	0	8	0	0	0
	Cholera Infantum	22	14	0	0	0	9	0	25	20	64	50	7	0	8
	Cholera Morbus	21	21	0	0	0	27	30	38	60	73	33	0	0	17
	Consumption, Pulmonary	43	55	67	67	75	64	10	25	40	55	50	67	58	58
	Croup, Membranous	7	6	7	0	0	0	0	13	10	9	8	7	0	17
	Diphtheria	15	14	0	8	33	0	10	13	20	9	8	27	25	8
	Diarrhea	56	51	20	33	58	36	60	25	30	90	92	73	50	33
	Dysentery	29	21	0	0	0	0	10	0	30	73	75	47	8	0
	Erysipelas	32	26	53	42	42	27	30	38	10	18	17	7	25	8
	Fever, Intermittent	73	40	33	33	33	45	50	50	40	36	33	33	50	50
	Fever, Remittent	42	22	33	33	33	36	10	0	40	45	17	7	0	8
	Fever, Typhoid (Enteric)	11	22	0	0	0	0	40	50	50	36	8	40	33	25
	Fever, Typho-malarial	27	19	0	8	0	0	20	25	10	36	42	60	0	17
	Influenza	46	21	40	67	67	36	10	0	0	0	0	7	0	8
	Kidney, Inflammation of	24	20	13	8	8	36	60	38	20	9	42	0	17	8
	Measles	14	4	0	0	25	0	10	0	0	0	0	7	0	8
	Neuralgia	71	49	87	67	33	55	50	63	50	27	42	20	33	67
	Pleuritis	....	26	40	8	33	45	20	0	40	9	33	27	17	33
	Pneumonia	41	42	73	42	33	45	10	25	20	55	17	27	83	58
	Puerperal Fever	5	9	0	0	0	0	0	0	10	9	17	27	8	25
	Rheumatism	71	48	73	83	75	73	10	38	40	45	17	53	25	25
	Scarlatina	21	1	0	0	0	0	0	0	0	9	0	0	8	0
	Small-pox	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	58	54	67	67	75	55	50	38	20	36	42	47	75	58
	Whooping-cough	17	18	47	17	33	36	0	0	0	0	0	33	25	0

	Av. for Tab. Dis. Rep. Pres.	18	13	24	26	33	38	19	30	22	20	35	28	29	43	28	18	34	35	34	34	31	34	31	25	31	28	30
Northern Division.*	Brain, Inflammation of	2	21	7	25	33	25	10	38	30	25	7	20	0	0	4	1	0	7	0	8	0	0	0	0	0	6	0
	Bowels, Inflammation of	5	10	13	0	0	0	30	0	20	25	0	0	0	0	20	8	0	0	0	8	21	13	0	6	11	6	13
	Bronchitis	41	37	40	42	33	50	30	28	30	38	73	40	35	0	79	53	75	0	75	50	68	31	40	50	37	50	50
	Cerebro-spinal Meningitis	2	12	0	0	35	50	0	0	10	13	0	0	0	0	3	0.5	0	0	0	0	0	5	0	0	0	0	0
	Cholera Infantum	7	2	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	5	35	0	13	0	0	0
	Cholera Morbus	6	3	0	0	0	0	0	0	10	13	0	0	0	0	13	6	5	0	0	0	0	15	0	6	0	0	0
	Consumption, Pulmonary	20	39	33	33	33	50	30	50	30	25	33	25	25	75	57	30	40	33	50	58	37	70	0	13	0	50	50
	Croup, Membranous	1	1	7	0	0	0	0	0	0	0	7	0	0	0	7	1	0	0	6	0	0	0	0	0	0	0	0
	Diphtheria	7	1	0	0	0	0	0	0	0	0	0	0	0	0	9	1	0	0	0	0	5	0	0	0	0	0	0
	Diarrhœa	32	1	0	0	0	0	0	0	0	13	33	0	0	0	65	41	35	33	44	42	32	70	5	50	37	13	19
	Dysentery	20	4	0	0	0	0	0	0	30	13	13	0	0	0	26	13	5	13	0	0	11	30	35	25	0	6	0
	Erysipelas	18	32	33	25	33	50	20	25	30	25	0	0	0	25	23	16	30	0	0	25	5	25	15	19	21	25	19
	Fever, Intermittent	26	12	0	0	8	13	10	13	0	13	0	30	0	25	27	52	40	40	0	67	58	75	0	38	0	50	50
	Fever, Remittent	6	5	0	0	0	0	10	0	10	13	0	30	0	0	19	2	0	0	0	8	0	0	0	0	0	6	0
	Fever, Typhoid (Enteric)	9	3	0	0	0	0	0	0	0	13	0	20	0	0	3	3	0	0	0	8	0	0	0	6	0	31	0
	Fever, Typho-malarial	10	0	0	0	0	0	0	0	0	0	0	0	0	0	8	11	0	0	19	0	0	0	0	25	37	0	6
	Influenza	24	7	0	0	33	88	0	0	0	0	60	0	0	0	37	50	65	60	56	58	63	30	40	44	53	50	38
	Kidney, Inflammation of	7	17	13	17	33	25	0	13	10	0	27	10	50	50	31	30	15	27	13	17	21	25	10	0	16	6	13
	Measles	10	3	0	8	0	0	0	0	0	25	13	0	0	0	11	1	0	13	0	0	0	0	0	0	0	0	0
	Neuralgia	48	31	33	33	42	50	10	38	20	25	60	30	25	0	81	46	65	60	50	50	0	40	0	38	37	38	35
	Pleuritis	...	11	0	0	33	25	0	0	0	25	20	20	0	0	...	6	30	20	6	0	42	10	0	6	5	6	0
	Pneumonia	20	2	0	0	0	0	0	0	0	13	0	0	25	0	33	19	30	47	25	25	26	10	0	0	0	13	38
	Puerperal Fever	7	1	0	0	8	0	0	0	0	0	0	0	0	0	3	2	10	0	19	0	0	0	0	0	0	0	0
	Rheumatism	54	45	33	50	67	50	30	38	50	25	38	60	25	75	75	48	50	27	42	42	53	45	10	50	58	56	31
	Scarlatina	4	0	0	0	0	0	0	0	0	0	0	0	0	0	6	5	0	0	0	0	0	0	0	0	5	31	25
	Small-pox	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	30	20	20	33	42	25	10	13	20	0	13	20	0	25	67	32	25	53	50	25	16	13	10	38	42	56	31
	Whooping-cough	10	9	33	17	0	0	0	0	10	25	0	0	0	0	8	15	45	0	38	35	0	25	23	6	0	0	0

*, †, d. See page 109. † Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 9 years, 1880-8; for neuralgia and tonsilitis, an average for the 10 years, 1879-88; for other diseases and for the average line, an average for the 12 years 1877-88. For the Northern Division 1882-88. For the Northeastern Division 1883-88.

TABLE 2.—CONTINUED.—*Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the Years 1877–1888, and by Months in 1889, indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	1877–88.‡	1889.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Western Division.*	Av. for Tab. Dis. Rep. Pres.	31	24	26	29	29	29	27	26	25	30	31	26	26	26
	Brain, Inflammation of	5	5	0	0	7	6	4	0	2	5	7	10	3	9
	Bowels, Inflammation of	16	9	8	11	4	16	11	11	7	10	7	8	10	14
	Bronchitis	55	45	53	54	52	48	53	31	48	37	36	31	62	54
	Cerebro-spinal Meningitis	3	5	0	0	7	0	11	0	2	5	7	6	8	11
	Cholera Infantum	15	8	0	0	0	0	0	0	9	24	36	12	3	0
	Cholera Morbus	20	11	0	0	0	10	7	3	9	44	30	18	0	0
	Consumption, Pulmonary	48	46	56	57	59	52	47	46	39	39	43	47	41	37
	Croup, Membranous	7	4	6	0	4	0	2	6	4	0	0	4	18	6
	Diphtheria	24	7	18	0	0	3	4	3	2	2	11	14	10	9
	Diarrhœa	46	49	24	29	26	29	29	34	67	95	89	59	49	53
	Dysentery	24	19	3	0	4	10	9	6	20	59	61	20	8	0
	Erysipelas	29	22	26	4	30	26	24	20	7	32	18	12	33	34
	Fever, Intermittent	73	53	53	54	44	55	19	46	72	83	61	47	31	37
	Fever, Remittent	60	33	20	18	26	35	31	34	20	37	45	33	41	40
	Fever, Typhoid Enteric	10	9	21	7	0	0	0	0	0	2	14	31	21	9
	Fever, Typho-malarial	25	20	18	14	7	16	24	11	13	22	36	33	21	11
	Influenza	45	48	53	50	37	58	64	46	37	15	27	45	49	34
	Kidney, Inflammation of	14	14	6	7	15	13	20	29	9	10	9	14	18	20
	Measles	6	9	12	7	0	10	20	26	17	2	0	0	8	11
	Neuralgia	72	67	56	64	78	65	69	60	65	63	70	63	85	69
	Pleuritis	----	13	12	21	15	26	16	17	11	12	11	2	10	9
	Pneumonia	37	25	18	39	48	32	33	17	26	24	5	24	23	17
	Puerperal Fever	6	9	15	18	19	3	13	14	9	0	5	10	5	0
	Rheumatism	62	68	62	54	78	74	78	17	70	71	59	59	64	74
	Scarlatina	22	4	3	7	0	3	18	3	0	0	0	4	3	6
	Small-pox	0.7	1	0	0	0	0	0	0	0	0	0	0	3	9
	Tonsillitis	54	51	56	50	41	61	44	46	39	32	45	57	72	71
	Whooping-cough	16	9	12	14	4	19	4	6	15	5	5	8	8	14

Div.*	Diseases.	1877–88.‡	1889.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northern Central Division.*	Av. for Tab. Dis. Rep. Pres.	27	20	27	34	37	25	21	24	24	33	27	26	32	36
	Brain, Inflammation of	3	5	3	13	0	9	4	0	5	0	0	0	17	8
	Bowels, Inflammation of	5	4	10	4	0	5	4	0	10	0	0	7	0	0
	Bronchitis	51	44	59	57	55	55	52	30	35	31	29	33	38	25
	Cerebro-spinal Meningitis	8	1	3	4	0	0	0	0	0	0	0	0	0	0
	Cholera Infantum	12	7	0	0	0	0	0	0	20	38	36	7	0	0
	Cholera Morbus	16	9	0	0	0	0	10	25	50	29	7	8	0	0
	Consumption, Pulmonary	33	34	31	39	35	27	32	20	25	44	43	47	38	50
	Croup, Membranous	8	4	10	0	15	9	4	0	0	0	0	0	0	0
	Diphtheria	25	5	10	0	0	0	0	5	0	6	14	0	0	33
	Diarrhœa	45	32	14	39	40	14	20	30	55	56	36	27	50	33
	Dysentery	17	15	21	4	10	9	8	5	45	50	14	7	0	0
	Erysipelas	28	29	48	39	35	23	28	30	15	13	14	7	38	50
	Fever, Intermittent	66	50	45	57	60	50	52	50	40	44	57	67	25	50
	Fever, Remittent	53	30	24	26	40	32	24	20	30	38	29	33	50	33
	Fever, Typhoid Enteric	8	6	0	0	0	0	0	0	5	6	21	53	0	0
	Fever, Typho-malarial	28	8	3	13	20	9	12	0	0	0	7	20	8	0
	Influenza	10	2	7	0	0	5	0	0	0	0	0	7	0	8
	Kidney, Inflammation of	7	16	10	26	25	27	20	15	10	0	0	0	17	33
	Measles	15	7	0	0	5	5	8	30	25	0	7	0	0	8
	Neuralgia	54	51	55	65	70	55	52	40	40	44	36	27	50	67
	Pleuritis	----	4	10	9	10	5	4	0	0	0	0	0	0	0
	Pneumonia	31	35	59	70	60	41	28	15	5	6	0	47	33	25
	Puerperal Fever	5	6	3	0	0	9	8	5	10	13	0	27	0	0
	Rheumatism	59	54	62	61	65	64	32	55	55	63	36	33	50	67
	Scarlatina	7	21	31	39	30	18	4	25	20	18	21	13	0	25
	Small-pox	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	56	47	72	57	60	55	44	30	20	25	36	40	58	58
	Whooping-cough	14	16	21	17	30	27	4	15	15	0	21	20	8	0

Bay and Eastern Division.*															Central Division.*													
Av. for Tab. Dis. Rep. Pres...	32	28	31	25	26	27	31	29	29	32	32	30	27	28		27	21	22	22	22	28	20	20	25	26	29	26	26	23
Brain, Inflammation of	6	7	5	2	6	8	8	10	4	10	7	10	11	9		5	2	0	2	2	2	4	2	1	2	0	3	0	5
Bowels, Inflammation of	21	21	17	12	17	12	18	15	21	30	26	24	27	26		13	14	5	3	9	3	15	15	21	17	19	18	19	16
Bronchitis	68	68	62	64	65	75	71	66	68	59	61	75	77	77		53	51	56	64	74	64	49	49	44	33	43	48	52	50
Cerebro-spinal Meningitis	5	5	0	4	4	10	11	2	5	15	6	4	1	0		5	1	1	0	0	0	2	2	0	2	0	1	0	3
Cholera Infantum	17	26	3	0	0	4	2	0	42	75	66	16	6	3		11	7	0	2	0	0	1	2	8	32	35	8	0	0
Cholera Morbus	21	20	0	0	0	2	3	7	46	77	56	19	4	1		15	12	0	2	0	0	0	9	23	45	41	16	3	0
Consumption, Pulmonary	66	61	46	46	52	57	68	68	69	65	68	67	61	66		58	44	49	41	35	34	39	44	55	53	41	43	40	45
Croup, Membranous	9	4	5	6	2	6	3	0	1	1	3	7	9	7		3	1	4	0	2	0	2	1	1	0	0	3	0	0
Diphtheria	25	7	0	0	2	2	11	10	2	7	6	18	10	11		19	4	5	2	2	3	2	2	0	2	2	5	6	13
Diarrhea	49	45	18	2	24	22	37	34	36	90	71	58	36	21		42	40	28	21	22	29	30	26	55	88	79	54	36	19
Dysentery	19	18	9	0	7	12	8	7	24	55	46	13	11	7		14	15	4	3	0	0	4	10	16	48	59	24	13	6
Erysipelas	24	23	29	24	28	25	32	30	25	13	9	18	26	19		19	28	14	26	17	25	13	23	28	22	25	30	24	27
Fever, Intermittent	73	48	40	30	39	55	55	54	54	49	50	49	50	41		70	41	38	33	26	24	30	37	59	58	46	50	43	39
Fever, Remittent	41	33	38	24	28	18	18	22	29	39	43	48	34	38		46	36	34	24	30	42	25	40	42	44	46	50	37	28
Fever, Typhoid (Enteric)	9	13	14	4	6	6	6	14	5	7	26	23	19	27		12	6	7	0	0	0	3	2	2	13	18	20	4	2
Fever, Typho-malarial	28	23	20	2	9	20	18	10	20	31	44	43	19	24		19	9	7	7	2	0	4	14	6	11	22	21	9	9
Influenza	42	34	48	46	46	43	35	34	18	15	19	35	36	43		36	27	34	43	43	53	24	16	16	14	16	29	25	28
Kidney, Inflammation of	21	24	18	12	24	20	40	36	26	23	23	18	20	30		20	20	12	16	15	15	18	27	30	23	17	21	19	16
Measles	15	6	6	4	6	4	2	5	7	4	6	8	7	7		10	18	15	9	11	14	12	19	9	9	11	11	18	23
Neuralgia	70	70	66	64	70	76	85	78	67	62	66	63	73	74		64	65	65	66	50	66	68	65	71	47	60	69	72	69
Pleuritis	....	23	38	30	33	33	34	22	18	13	10	14	21	27		....	12	16	10	11	17	12	9	10	11	8	10	16	11
Pneumonia	40	30	58	32	46	47	42	31	13	14	17	22	20	33		32	21	27	38	26	17	28	11	10	11	19	24	24	16
Puerperal Fever	5	5	0	0	2	4	0	7	4	8	9	11	3	6		5	6	14	9	2	5	4	6	6	3	3	6	10	6
Rheumatism	74	69	71	64	69	65	85	81	64	45	70	76	69	71		61	58	55	50	52	68	59	53	63	53	51	66	58	59
Scarlatina	17	8	15	12	2	10	0	7	12	7	4	9	10	7		12	8	14	7	6	17	15	7	2	3	3	15	3	5
Small-pox	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0		0.4	0.4	4	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	50	48	60	48	54	55	54	47	28	42	44	45	49	56		41	42	47	57	43	47	40	33	33	31	29	41	64	50
Whooping-cough	24	18	17	20	20	31	34	29	28	20	14	7	0	11		16	11	3	3	9	14	20	15	16	5	11	10	7	11

*, †, d. See page 109. ‡ Inflammation of kidney was not compiled until 1884. For inflam. of brain and inflam. of bowels, an average for the 9 years 1880–8; for neuralgia and tonsillitis, an av. for the 10 years 1879–88; for other diseases, and for the av. line, an av. for the 12 years 1877–88.

TABLE 2.—CONTINUED.—*Diseases in the Southwestern and Southern Central Divisions of the State, for the years 1877–88, and by Months in 1889,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	1887–88.‡	1889.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southwestern Division.*	Av. for Tab. Dis. Rep. Pres...	28	23	31	32	31	30	24	22	24	34	33	26	27	26
	Brain, Inflammation of	4	2	8	0	4	3	2	0	4	2	0	2	0	2
	Bowels, Inflammation of	10	12	13	7	14	7	11	5	11	23	13	9	11	23
	Bronchitis	53	48	50	57	61	59	55	48	38	32	42	41	45	58
	Cerebro-spinal Meningitis	2	1	0	4	0	0	4	0	2	0	0	0	0	0
	Cholera Infantum	19	13	0	0	0	0	0	3	22	61	49	11	0	0
	Cholera Morbus	16	13	0	0	0	3	4	8	31	52	38	2	2	5
	Consumption, Pulmonary	70	46	42	46	43	59	42	50	51	52	51	45	38	33
	Croup, Membranous	4	2	0	4	0	7	0	0	0	0	0	7	0	2
	Diphtheria	12	3	5	0	11	7	0	0	0	0	0	5	6	0
	Diarrhea	39	33	8	0	7	14	23	35	58	89	60	39	11	21
	Dysentery	14	21	13	7	0	0	8	3	49	66	56	16	13	2
	Erysipelas	22	18	18	14	18	31	13	13	9	30	27	13	17	23
	Fever, Intermittent	76	44	42	25	25	48	47	43	47	43	53	54	47	35
	Fever, Remittent	48	29	32	32	14	24	17	23	27	45	38	39	26	26
	Fever, Typhoid (Enteric)	6	4	0	0	0	0	0	0	2	0	9	11	11	5
	Fever, Typho-malarial	22	26	26	18	18	24	8	8	16	34	44	46	38	26
	Influenza	42	28	39	36	45	52	32	8	2	11	24	34	28	44
	Kidney, Inflammation of	14	9	13	14	14	14	9	10	9	9	7	2	9	9
	Measles	11	3	0	0	4	3	9	5	0	0	0	2	2	9
	Neuralgia	73	62	63	86	61	83	64	68	53	61	58	54	60	58
	Pleuritis	....	20	26	18	29	34	28	20	18	9	20	16	13	19
	Pneumonia	31	31	53	57	64	38	26	10	11	5	11	34	51	33
	Puerperal Fever	3	7	0	11	14	14	9	3	4	14	4	7	2	9
	Rheumatism	75	74	82	82	86	97	74	75	73	61	60	70	79	67
	Scarlatina	12	10	13	0	0	3	9	3	2	2	4	21	23	26
	Small-pox	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	36	44	47	61	57	52	42	35	24	32	33	45	53	63
	Whooping-cough	18	20	0	0	0	14	15	18	11	16	27	39	38	37
Southern Central Division.*	Av. for Tab. Dis. Rep. Pres...	29	25	28	29	32	30	30	26	27	31	31	28	27	26
	Brain, Inflammation of	4	4	4	5	6	4	5	3	1	7	10	3	1	3
	Bowels, Inflammation of	14	11	13	14	8	2	5	7	18	15	11	21	9	7
	Bronchitis	64	61	67	70	68	67	66	51	51	49	51	66	72	63
	Cerebro-spinal Meningitis	4	1	1	2	4	0	3	0	0	0	1	2	1	0
	Cholera Infantum	11	9	0	4	0	0	0	4	26	32	26	1	3	1
	Cholera Morbus	19	14	1	0	0	0	6	9	31	56	40	4	0	3
	Consumption, Pulmonary	61	42	48	34	51	40	48	42	34	30	37	47	49	49
	Croup, Membranous	4	1	3	2	4	0	0	0	0	0	0	0	0	4
	Diphtheria	14	6	9	0	0	4	0	0	0	0	12	13	12	12
	Diarrhea	46	52	41	32	40	25	30	45	72	95	89	65	34	40
	Dysentery	18	19	9	7	6	8	6	7	20	55	51	27	12	5
	Erysipelas	19	12	6	13	21	19	21	10	6	12	8	8	14	11
	Fever, Intermittent	72	48	39	30	43	40	36	45	59	59	63	52	50	51
	Fever, Remittent	53	37	23	25	30	35	35	40	40	36	55	56	32	30
	Fever, Typhoid (Enteric)	9	6	7	13	8	4	0	0	1	10	11	8	9	8
	Fever, Typho-malarial	18	16	14	18	11	19	5	3	9	23	33	32	18	5
	Influenza	38	46	62	61	81	67	62	42	22	26	26	42	41	47
	Kidney, Inflammation of	20	18	19	21	17	17	12	13	21	15	18	21	22	21
	Measles	11	4	1	0	0	8	13	13	7	1	1	1	3	3
	Neuralgia	70	71	72	73	79	81	70	63	67	59	64	75	73	84
	Pleuritis	....	18	26	34	36	25	17	12	8	5	4	15	24	22
	Pneumonia	35	26	45	59	57	50	26	12	1	3	14	20	32	23
	Puerperal Fever	3	0.6	0	0	2	2	0	0	0	0	0	2	1	0
	Rheumatism	72	76	72	73	72	73	92	79	74	73	77	73	72	82
	Scarlatina	15	11	35	7	17	19	17	13	1	5	1	7	15	5
	Small-pox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	50	49	55	46	57	56	56	51	35	29	41	57	53	59
	Whooping-cough	17	18	17	16	26	17	23	18	21	21	19	14	15	12

*, †, d. See page 109. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 9 years 1880–88; for neuralgia and tonsillitis an average for the 10 years 1879–88; for other diseases and for average line an average for the 12 years 1877–88.

TABLE 2.—CONTINUED.—*Diseases in the Southeastern Division of the State, for the years 1877-88, and by Months in 1889,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	1877-88.‡	1889.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southeastern Division.[s]	Av. for Tab. Dis. Rep. Pres.	34	27	31	31	34	33	26	30	28	34	33	34	28	30
	Brain, Inflammation of	14	6	0	12	2	5	6	10	6	7	5	4	7	15
	Bowels, Inflammation of	21	17	8	19	14	21	13	15	26	24	21	19	9	17
	Bronchitis	67	74	92	91	86	90	73	59	51	51	70	81	68	72
	Cerebro-spinal Meningitis	8	2	0	12	2	5	2	0	0	2	5	0	0	0
	Cholera Infantum	16	9	0	0	0	0	2	3	19	49	35	0	2	0
	Cholera Morbus	23	14	3	2	0	8	4	0	47	63	30	8	2	2
	Consumption, Pulmonary	78	74	68	79	77	79	73	77	70	68	86	75	70	70
	Croup, Membranous	12	5	7	12	9	8	4	0	0	0	5	10	0	7
	Diphtheria	29	9	17	14	12	18	10	5	4	2	2	6	5	7
	Diarrhea	52	50	32	42	35	41	42	36	72	78	88	62	36	37
	Dysentery	26	17	5	7	9	5	8	3	11	49	60	31	12	13
	Erysipelas	33	35	46	40	47	56	31	31	34	22	21	29	25	37
	Fever, Intermittent	66	45	31	35	35	56	60	62	30	61	58	48	45	33
	Fever, Remittent	42	34	27	21	33	46	23	28	30	37	58	50	34	22
	Fever, Typhoid (Enteric)	23	19	10	14	5	8	6	13	13	24	28	42	41	26
	Fever, Typho-malarial	23	18	15	12	16	23	13	15	17	24	26	38	9	4
	Influenza	41	29	42	58	53	54	17	0	2	15	21	31	11	43
	Kidney, Inflammation of	26	35	46	33	44	44	38	44	53	22	30	27	25	17
	Measles	18	3	2	2	0	10	17	0	0	0	0	0	0	2
	Neuralgia	57	56	61	60	60	59	52	51	45	46	51	52	57	74
	Pleuritis		18	22	26	49	31	8	18	6	2	5	15	14	15
	Pneumonia	40	32	36	58	56	56	19	23	21	20	16	19	23	37
	Puerperal Fever	10	7	12	7	2	5	6	0	2	0	7	13	14	7
	Rheumatism	73	74	80	79	74	79	77	77	66	51	67	75	75	78
	Scarlatina	26	14	27	16	21	15	17	15	15	0	7	13	9	9
	Small-pox	3.5	2	8	7	0	3	0	0	0	0	0	0	0	0
	Tonsillitis	48	47	66	60	56	46	46	33	17	34	14	46	66	67
	Whooping-cough	26	20	12	26	26	26	33	13	17	32	35	21	0	0

*, †, d. See page 109. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 9 years 1880-88; for neuralgia and tonsillitis an average for the 9 years, 1879-88; for other diseases and for average line an average for the 12 years 1877-88.

TABLE 4.—*A Summary for the Year 1889, relative to Diseases in each of the Eleven Divisions of the State,†—indicating the prevalence as regards both Time and Area.*

Diseases.	Upper Peninsular Div.*				Northwestern Div.*				Northern Div.*				Northeastern Div.*				Northern Central Div.*			
	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Present, e
Average for Tabulated Diseases Reported Present	39	59	23	2.6	45	57	26	3.6	24	54	13	2.4	30	60	18	2.6	34	59	20	2.7
Brain, Inflammation of	18	41	7	3.1	36	38	14	2.8	40	52	21	3.2	6	27	1	1.3	15	31	5	2.6
Bowels, Inflammation of	28	39	11	3.4	45	51	23	3.1	20	48	10	2.8	23	35	8	3.8	15	24	4	2.5
Bronchitis	99	76	75	1.9	67	91	60	3.1	52	70	37	2.4	68	77	53	2.3	57	76	44	2.3
Cerebro-spinal Meningitis	14	30	4	2.9	9	25	2	5.7	20	62	12	3.2	2	20	0.5	1.0	4	22	1	4.0
Cholera Infantum	31	43	14	2.7	30	49	14	3.0	4	50	2	2.0	19	41	8	2.6	13	55	7	3.3
Cholera Morbus	54	49	27	2.6	39	59	21	2.7	12	21	3	3.0	15	40	6	1.9	20	44	9	2.8
Consumption, Pulmonary	50	65	32	2.8	67	84	55	4.7	48	81	39	1.8	47	64	30	2.6	52	64	34	3.6
Croup, Membranous	8	36	3	2.5	21	27	6	3.7	4	20	1	4.0	4	25	1	2.5	9	39	4	3.6
Diphtheria	29	52	15	3.1	36	37	14	5.4	4	20	1	1.0	4	22	1	1.0	9	35	5	3.2
Diarrhea	88	75	66	2.0	75	67	51	3.4	4	25	1	2.0	55	74	41	2.4	61	58	32	2.6
Dysentery	43	47	20	3.0	36	56	21	3.4	8	44	4	2.0	30	42	13	2.8	30	49	15	2.9
Erysipelas	36	42	15	3.1	64	43	26	3.5	48	67	32	2.2	36	50	18	3.5	61	47	29	3.5
Fever, Intermittent	11	41	4	2.1	55	74	40	2.2	32	38	12	2.9	66	78	52	2.4	65	75	50	2.3
Fever, Remittent	8	52	4	2.2	39	56	22	4.0	16	26	5	2.3	9	28	2	2.8	46	64	30	2.2
Fever, Typhoid (Enteric)	39	66	26	2.6	33	65	22	4.1	8	33	3	1.0	6	50	3	2.0	11	48	6	2.7
Fever, Typho-malarial	4	46	2	2.0	30	59	19	4.2	0	0	0	0	21	52	11	2.2	22	35	8	2.9
Influenza	33	61	20	1.8	33	62	21	4.9	16	50	7	3.5	70	72	50	1.7	7	29	2	2.5
Kidney, Inflammation of	46	50	23	2.8	55	37	20	3.3	40	42	17	3.3	40	49	20	3.7	24	67	16	2.2
Measles	9	29	2	3.1	12	33	4	5.3	8	38	3	1.5	2	50	1	2.0	17	45	7	2.8
Neuralgia	90	70	63	2.5	79	63	49	3.1	56	56	31	1.6	77	60	46	2.3	74	68	51	2.4
Pleuritis	43	50	21	3.2	58	45	26	3.9	24	57	11	3.0	17	36	6	4.3	15	36	4	2.6
Pneumonia	41	49	21	3.0	75	56	42	3.9	8	25	2	1.5	36	58	19	3.2	61	57	35	3.0
Puerperal Fever	10	26	2	3.0	27	32	9	4.8	4	25	1	2.0	6	33	2	2.7	17	33	6	2.4
Rheumatism	75	67	50	2.6	88	54	48	3.4	64	70	45	1.4	64	66	43	2.6	76	70	54	2.4
Scarlatina	21	75	17	2.5	6	25	1	5.5	0	0	0	0	9	59	5	2.8	33	62	21	3.3
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	90	63	57	2.8	85	63	54	3.5	48	42	20	2.3	55	58	32	2.8	65	73	47	2.9
Whooping-cough	30	57	17	2.7	21	81	18	4.6	16	55	9	2.8	19	77	15	2.3	28	56	16	2.5

* For counties in each division, see Exhibit I., page 95. b, c, d, e. See foot-notes with these marks in Table 2, page 109.
† This page includes the Five Divisions of the State from which the fewest Weekly Reports were received,

TABLE 4.—CONTINUED.†

Diseases.	Western Division.*				Bay and Eastern.*				Central Division.*				Southwestern Div.*				S. Central Div.*				Southeastern Div.*			
	Per ct. of Observers Reporting Pres. of, b	Av. Per ct. of Weeks Reported Present, where present, c	Per cent of Reports stating Pres. of, d.	Av. order of Prevalence where Pres. e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Per ct. of Observers Reporting Pres. of, b	Av. Per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Per ct. of Observers Reporting Pres. of, b	Av. Per ct. of Weeks Reported Present where Present, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e
Average for Tabulated Diseases Reported Present	38	62	24	3.5	41	68	28	3.7	30	62	21	2.9	36	63	23	3.1	36	69	25	3.5	40	67	27	3.6
Brain, Inflammation of	12	38	5	4.0	19	39	7	6.0	5	41	2	3.1	7	31	2	4.4	11	39	4	7.5	18	38	6	5.3
Bowels, Inflammation of	27	34	9	3.8	37	57	21	5.0	32	45	14	3.6	30	41	12	3.2	20	54	11	4.6	33	50	17	5.3
Bronchitis	68	67	45	3.6	81	85	68	3.0	71	71	51	2.7	66	66	48	2.9	79	77	61	2.6	88	83	74	2.1
Cerebro-spinal Meningitis	10	49	5	3.0	11	45	5	5.6	3	31	1	3.4	3	29	1	2.0	4	29	1	4.8	5	43	2	5.6
Cholera Infantum	18	47	8	3.7	31	64	20	3.5	15	52	7	3.6	24	54	13	3.4	16	55	9	4.1	18	47	9	3.4
Cholera Morbus	20	57	11	4.8	33	59	20	3.8	21	55	12	3.4	26	50	13	3.9	26	52	14	3.5	26	52	14	3.2
Consumption, Pulmonary	59	77	46	4.4	66	93	61	3.3	53	88	44	3.5	61	74	46	3.7	53	80	42	4.5	82	90	74	2.4
Croup, Membranous	12	35	4	3.9	11	36	4	5.1	4	26	1	2.9	4	36	2	5.6	3	32	1	4.7	11	49	5	5.1
Diphtheria	18	37	7	3.2	12	61	7	4.0	9	41	4	4.0	7	37	3	2.8	9	57	6	7.4	15	55	9	4.9
Diarrhea	71	68	49	3.2	60	75	45	3.3	60	66	40	2.5	58	55	33	2.7	74	70	52	2.9	69	71	50	3.0
Dysentery	35	52	19	3.6	33	54	18	4.7	31	52	15	3.1	39	52	21	3.4	33	57	19	4.5	32	51	17	3.6
Erysipelas	45	48	22	4.8	45	51	23	4.3	45	51	23	3.6	35	51	18	4.2	30	39	12	4.5	54	63	35	4.8
Fever, Intermittent	71	75	53	2.2	66	74	48	2.8	64	65	41	2.5	64	70	44	2.5	65	73	48	2.6	64	70	45	3.3
Fever, Remittent	55	61	33	3.3	47	68	33	3.8	52	67	36	2.2	43	66	29	3.2	50	74	37	3.3	58	60	34	3.6
Fever, Typhoid (Enteric)	16	57	9	2.7	21	61	13	4.5	11	55	6	4.0	7	55	4	3.1	10	64	6	4.4	39	63	19	5.0
Fever, Typho-malarial	31	61	20	3.6	33	69	23	4.5	19	58	9	3.4	40	66	26	3.0	26	61	16	5.8	29	60	18	2.9
Influenza	64	65	43	2.6	51	65	34	2.8	46	59	27	2.3	45	62	28	2.5	63	74	46	2.1	46	62	29	2.8
Kidney, Inflammation of	29	48	14	3.8	40	61	24	4.9	32	61	20	3.6	18	51	9	3.2	27	66	18	4.9	56	62	35	5.1
Measles	17	55	9	3.6	12	49	6	4.0	24	55	13	2.6	8	38	3	4.1	8	52	4	4.9	5	56	3	5.3
Neuralgia	85	79	67	2.8	87	80	70	2.8	83	78	65	2.6	83	74	62	2.6	85	83	71	2.3	78	77	56	3.1
Pleuritis	32	41	13	4.2	40	59	23	4.2	26	44	12	3.0	39	50	20	3.8	29	60	18	4.7	33	52	18	5.3
Pneumonia	51	48	25	3.9	49	61	30	4.2	37	55	21	2.9	48	61	31	3.4	46	57	26	4.3	57	53	32	4.1
Puerperal Fever	19	45	9	3.1	12	40	5	4.5	17	37	6	2.6	13	53	7	2.3	2	29	0.6	5.8	17	37	7	4.6
Rheumatism	81	85	68	3.3	87	79	69	3.1	74	77	58	2.6	87	83	74	2.6	91	83	76	2.9	83	87	74	3.0
Scarlitina	11	35	4	2.8	15	53	8	4.1	18	46	8	3.0	19	50	10	2.8	19	59	11	4.8	24	57	14	5.8
Small-pox	2	50	1	2.0	0	0	0	0	0.5	60	0.4	5.0	0	0	0	0	0	0	0	0	2	69	2	1.9
Tonsilitis	78	65	51	3.7	71	67	48	4.0	70	60	42	2.7	66	66	44	3.4	69	70	49	3.2	74	62	47	3.4
Whooping-cough	18	55	9	4.4	29	62	18	2.9	20	54	11	2.8	29	68	20	3.0	26	70	18	4.2	27	74	20	3.5

* For counties in each division, see Exhibit I., page 95. b, c, d, e. See foot-notes with these marks in Table 2, page 109.
† This page includes the Six Divisions of the State from which the most Weekly Reports were Received.

WHAT DISEASES CAUSE MOST SICKNESS.

This is shown in Exhibit VI., in this Report, and in similar exhibits in previous Reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan. In 1884 neuralgia headed the list, with rheumatism second and intermittent fever third. In 1885 neuralgia again headed the list, intermittent fever second, rheumatism third. In 1886 rheumatism headed the list, neuralgia second, bronchitis third, and intermittent fever fourth. In 1887 rheumatism, neuralgia, bronchitis and consumption of the lungs, in the order named, headed the list. In 1888 rheumatism, neuralgia, bronchitis and intermittent fever, in order named, headed the list. In 1889 rheumatism, neuralgia, bronchitis and diarrhea, in order named, caused most sickness in Michigan.

Nearly the same diseases appear above the average line each year. Pneumonia has appeared in this exhibit tenth in order for ten years in succession. Some of the diseases of minor importance vary considerably in their order. Whooping-cough, for example, in 1881 and 1883, was nineteenth in order, and rose to twelfth in order in 1886, and dropped to nineteenth in 1887, and to twentieth in 1888, and rose to eleventh place in 1889.

Exhibit VII. supplies data relative to what diseases caused most sickness in 1889 in each of several geographical divisions of Michigan. It may be seen that there is evidence that there are very great differences in the different parts of the State. Further evidence is very desirable, however, in order to reach conclusions on this important subject. The exhibit will be found of great interest to those who study it carefully, and in connection with previous reports.

EXHIBIT VI.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1889, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also Order, Per Cent of Reports, and Average Order for the same Diseases in 1888, 1887, 1886, and 1885.*

	1889.				1888.			1887.			1886.			1885.		
	Order.*	Diseases in Order of Apparent Amount of Sickness in 1889, Most Prevalent Disease First.	Per Cent of Reports Stating Pres'ce of, d	Av. Order of Prevalence when Present, e	Order.*	Per Cent of Reports Stating Pres'ce of, d	Av. Order of Prevalence when Present, e	Order.*	Per Cent of Reports Stating Pres'ce of, d	Av. Order of Prevalence when Present, e	Order.*	Per Cent of Reports Stating Pres'ce of, d	Av. Order of Prevalence when Present, e	Order.*	Per Cent of Reports Stating Pres'ce of, d	Av. Order of Prevalence when Present, e
More Sickness than Average for 28 Diseases in 1889.	1	Rheumatism	65	2.8	1	66	3.0	1	69	3.2	1	70	3.2	3	68	3.2
	2	Neuralgia	63	2.6	2	62	2.7	2	67	2.8	2	67	2.8	1	68	2.8
	3	Bronchitis	58	2.7	3	59	2.7	3	55	3.0	3	56	3.0	4	56	3.1
	4	Diarrhea	45	2.8	6	41	3.0	6	48	3.0	7	45	3.2	7	46	3.3
	5	Intermittent Fever	43	2.6	4	45	2.6	5	48	2.8	4	54	2.6	2	59	2.4
	6	Consumption, Pulmonary	48	3.5	5	49	3.6	4	51	3.7	5	55	3.9	5	58	4.0
	7	Tonsillitis	46	3.3	7	41	3.4	7	47	3.4	6	49	3.4	6	50	3.5
	8	Influenza	32	2.4	8	32	2.7	8	33	3.0	8	35	2.7	8	34	2.9
	9	Remittent Fever	30	3.2	9	34	3.1	9	32	3.4	9	34	3.3	9	36	3.2
	(10)	Av. for 28 diseases †	23	3.3	(11)	24	3.5	(11)	25	3.7	(10)	26	3.7	(10)	26	3.8
Less than said Average.	10	Pneumonia	26	3.7	10	30	4.0	10	28	4.3	10	27	4.0	10	27	4.4
	11	Whooping-cough	16	3.3	20	9	3.9	19	14	4.2	12	20	3.7	13	14	4.1
	12	Erysipelas	22	4.1	11	24	4.4	11	24	4.7	11	23	4.5	11	24	4.6
	13	Dysentery	17	3.7	13	17	3.8	13	19	4.3	15	17	4.5	19	15	5.0
	14	Inflammation of Kidney	20	4.1	16	19	4.5	15	18	4.9	13	20	4.7	12	21	4.4
	15	Cholera Morbus	14	3.4	15	15	3.7	12	19	3.8	14	17	4.2	15	17	4.5

* Judging from the per cent of reports which stated presence of the diseases in connection with the order of prevalence when present.

† For 1885, 1886 and 1887 the average is for 27 diseases.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this report), by the number of men who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the average in this column.

METHOD OF RATING DISEASES, AS CAUSES OF SICKNESS, AS SHOWN IN EXHIBITS VI. AND VII.

In order to learn the order of the several diseases as they are arranged in Exhibits VI. and VII., considerable study and compilation must be performed. It is considered desirable to place on record here a description of the method. The method can best be explained by having in view one of the twelve "compiling tables;" accordingly the one used for the construction of Exhibit VI., for the entire State, for the year 1889, is here inserted, as follows:—

"Compiling Table" for State.—Rating of Sickness, in Michigan, in 1889.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Line Number.	"Per Cent" Scale.	"Order of Prevalence" Scale.	Rating, by "Per Cent of Reports."	Rating, by "Order of Prevalence."	Sums of "Per Cent" and "Order" Ratings.	Final Rating. Highest=1.	Per Cent of Reports.	Order of Prevalence.	Diseases.
			+.45 18	−.19 4	22.26	(10)	23	3.3	Average.
1	65.	2.4	−.07 26	−.47 9	34.46	27	5	4.8	Brain, Inflammation of.
2	62.593	2.72	+.19 22	+.38 6	28.57	19	14	4.1	Bowels, Inflammation of.
3	60.187	3.04	−.09 4	−.06 2	5.85	3	58	2.7	Bronchitis.
4	57.781	3.36	−.23 27	−.34 7	33.43	25	3	4.2	Cerebro-spinal Meningitis.
5	55.375	3.67	+.44 23	+.13 4	27.57	18	11	3.4	Cholera Infantum.
6	52.968	3.99	+.19 22	+.13 4	26.32	15	14	3.4	Cholera Morbus.
7	50.562	4.31	+.06 8	+.44 4	12.50	6	48	3.5	Consumption, Pulmonary.
8	48.156	4.63	−.23 27	−.03 7	33.74	26	3	4.3	Croup, Membranous.
9	45.749	4.95	−.48 26	−.03 7	32.49	24	6	4.3	Diphtheria.
10	43.343	5.27	+.31 9	+.25 2	11.56	4	45	2.8	Diarrhea.
11	40.937	5.59	−.05 21	+.09 5	26.04	13	17	3.7	Dysentery.
12	38.530	5.90	−.13 19	+.38 6	25.25	12	22	4.1	Erysipelas.
13	36.124	6.22	+.14 10	−.38 2	11.76	5	43	2.6	Fever, Intermittent.
14	33.718	6.54	−.45 16	−.50 4	19.05	9	30	3.2	Fever, Remittent.
15	31.311	6.86	−.14 24	−.28 6	29.58	20	10	3.9	Fever, Typhoid (Enteric).
16	28.905	7.18	+.36 21	−.28 6	27.08	17	16	3.9	Fever, Typho-malarial.
17	26.499	7.50	−.29 15	1	15.71	8	32	2.4	Influenza.
18	24.092	7.81	−.30 20	+.38 6	26.08	14	20	4.1	Kidney, Inflammation of.
19	21.686	8.13	−.48 26	+.44 4	29.96	22	6	3.5	Measles.
20	19.280	8.45	−.17 2	−.38 2	3.45	2	63	2.6	Neuralgia.
21	16.874	8.77	−.07 21	+.03 6	26.96	16	17	4.0	Pleuritis.
22	14.467	9.09	+.21 17	−.09 5	22.30	10	26	3.7	Pneumonia.
23	12.061	9.41	−.06 26	+.13 4	30.07	23	5	3.4	Puerperal Fever.
24	9.655	9.73	1	+.24 2	3.24	1	65	2.8	Rheumatism.
25	7.248	10.04	−.07 24	−.28 6	29.65	21	10	3.9	Scarlatina.
26	4.842	10.36	28	28	56.00	28	.03	11.0	Small-pox.
27	2.436	10.68	−.10 9	−.19 4	12.71	7	46	3.3	Tonsillitis.
28	0.030	11.00	+.36 21	−.19 4	25.17	11	16	3.3	Whooping-cough.

In using this table, the tenth, ninth and eighth columns are the ones first filled. The tenth column contains the names of the 28 principal diseases regularly reported present or absent, arranged in alphabetical order. The ninth column contains, relative to each disease, the reported "Order of Prevalence" where present. The eighth column contains the "Per Cent of Reports" which stated the presence of each disease (as shown in Exhibit IV., page 99). The first column contains consecutive numbers, for purpose of rating. The second column contains a scale with which to rate each disease with reference to its "Per Cent of Reports," the scale decreasing regularly by a constant difference from the highest to the lowest reported during that year. The "Constant Difference" is obtained by dividing the difference between the highest and the lowest "Per Cent of Reports," by one less than the whole number of diseases reported. Thus, in this instance, in column 8, the highest per cent of reports to be rated, is 65 (rheumatism), the lowest, .03 (small-pox). Then 65 — .03 = 64.97; 64.97 ÷ 27 = 2.406.

The third column contains a scale with which to rate each disease with reference to its "Order of Prevalence" reported during the year. The figures in this scale increase (in size but decrease in value) regularly by a constant difference, found by dividing the difference between the lowest and the highest "Order of Prevalence" reported, by one less than the whole number of diseases reported. In this instance, that constant difference is .319.

Column 4 is constructed from columns 8 and 2, as follows: take, for example, measles, for which (as shown in line 19, column 8) the per cent of reports is 6. In column 2, the figures nearest 6 are found opposite line number 26; accordingly 26 is the rating for measles, to be placed in column 4; but the per cent in column 8 being greater by 1.158 than the figures in column 2, opposite line number 26, the correction to be applied is found by dividing the difference (1.158), by 2.406 which is the "constant difference." This gives .48 as the correction to be deducted from the rating 26.

Column 5 is constructed from columns 9 and 3. Thus, to continue the rating of measles, the figures in column 9 (taken from table 2, pages 108–9), stating the reported "Order of Prevalence" of measles, are 3.5. In column 3, the figures nearest 3.5 are found opposite line number 4; accordingly 4 is the rating for measles, to be placed in column 5; but the "Order of Prevalence" in column 8 being greater by .14 than the figures in column 3 opposite line number 4, the correction to be applied is found by dividing the difference (.14) by .319, which is the "constant difference" used in column 3. This gives .44 as the correction to be added to the rating number 4, in column 5.

Column 6 contains the sums of these two ratings; thus, relative to measles, 26 — .48 and 4 + .44 = 29.96, which is entered in column 6.

The sums of the two ratings of each disease having been determined, in the manner described, the final ratings are entered in column 7, the disease causing the most sickness is numbered 1, that causing the next most sickness is numbered 2, and so on to the disease causing the least sickness, opposite which is placed the highest number. In this instance, measles was "22," in the final order; that is to say, there were 21 diseases which caused more sickness than measles did in Michigan in 1889.

EXHIBIT VII.—*In each of Eleven Geographical Divisions* of the State, the Fifteen Diseases from which there seems to have been the Greatest Amount of Sickness in 1889, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 28 Leading Diseases, when Studied in connection with the Average Order of Prevalence of said diseases when reported present.*

	Order.†	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of..d	Av. Order of Prevalence when Pres..e	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of..d	Av. Order of Prevalence when Pres..e	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of..d	Av. Order of Prevalence when Pres..e
		UPPER PENINSULA DIV.*			NORTHWESTERN DIV.*			NORTHERN DIVISION.*		
More Sickness than Average for 28 Diseases.	1	Bronchitis	75	1.9	Bronchitis	60	3.1	Rheumatism	45	1.4
	2	Diarrhea	66	2.0	Intermittent Fever	40	2.2	Consumption, Pul.	39	1.8
	3	Neuralgia	63	2.5	Neuralgia	49	3.1	Neuralgia	31	1.6
	4	Influenza	20	1.8	Tonsillitis	54	3.5	Bronchitis	37	2.4
	5	Rheumatism	50	2.6	Diarrhea	51	3.4	Erysipelas	32	2.2
	6	Tonsillitis	57	2.8	Rheumatism	48	3.4	Typhoid Fev.(ent.)	3	1.0
	7	Typho-mal. Fever	2	2.0	Pneumonia	42	3.9	Tonsillitis	20	2.3
	8	Cholera Morbus	27	2.6	Consumption, Pul.	55	4.7	Diphtheria	1	1.0
	9	Intermittent Fever	4	2.1	Cholera Morbus	21	2.7	Measles	3	1.5
	10	Typhoid Fever (ent.)	26	2.6	Inflam. of Bowels	23	3.1	Pneumonia	2	1.5
	(11)	Average	23	2.6				Average	13	2.4
	11	Consumption, Pul.	32	2.8	Erysipelas	26	3.5	Inflam. of Brain	21	3.2
	12	Remittent Fever	4	2.2	Inflam. of Brain	14	2.8	Remittent Fever	5	2.3
	(13)				Average	26	3.6			
Less	13	Scarlet Fever	17	2.5	Inflam. of Kidney	20	3.3	Cholera Infantum	2	2.0
	14	Inflam. of Kidney	23	2.8	Dysentery	21	3.4	Diarrhea	1	2.0
	15	Whooping-cough	17	2.7	Cholera Infantum	14	3.0	Puerperal Fever	1	2.0
		NORTHEASTERN DIV.*			WESTERN DIVISION.*			NORTHERN CEN. DIV.*		
More Sickness than Average for 28 Diseases.	1	Influenza	50	1.7	Intermittent Fever	53	2.2	Rheumatism	54	2.4
	2	Bronchitis	53	2.3	Neuralgia	67	2.8	Intermittent Fev.	50	2.3
	3	Intermittent Fever	52	2.4	Rheumatism	68	3.3	Neuralgia	51	2.4
	4	Neuralgia	46	2.3	Influenza	43	2.6	Bronchitis	44	2.3
	5	Diarrhea	41	2.4	Diarrhea	49	3.2	Remittent Fever	30	2.2
	6	Rheumatism	43	2.6	Tonsillitis	51	3.7	Tonsillitis	47	2.9
	7	Consumption, Pul.	30	2.6	Bronchitis	45	3.6	Diarrhea	32	2.6
	8	Tonsillitis	32	2.8	Remittent Fever	33	3.3	Inflam. of Kidney	16	2.2
	9	Diphtheria	1	1.0	Small-pox	1	2.0	Pneumonia	35	3.0
	10	Cerebro-spinal Men.	0.5	1.0	Typhoid Fever (ent.)	9	2.7	Whooping-cough	16	2.5
	(11)							Average	20	2.7
	11	Inflam. of Brain	1	1.3	Consumption, Pul.	46	4.4	Puerperal Fever	6	2.4
	(12)				Average	24	3.5			
Less.	12	Whooping-cough	15	2.3	Scarlet Fever	4	2.8	Inflam. of Bowels	4	2.5
	(13)	Average	18	2.6						
	13	Typho-mal. Fever	11	2.2	Puerperal Fever	9	3.1	Dysentery	15	2.9
	14	Cholera Morbus	6	1.9	Typho-mal. Fever	20	3.6	Influenza	2	2.5
	15	Typhoid Fever (ent.)	3	2.0	Cerebro-spinal Men.	5	3.0	Consumption, Pul.	34	3.6

* The counties in each division are stated in Exhibit I., page 95.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." *d*, *e*. Foot-notes with these marks are on page 109.

EXHIBIT VII.—CONTINUED.

	Order.†	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, *d*	Av. Order of Prevalence when Pres. *e*	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, *d*	Av. Order of Prevalence when Pres. *e*	Diseases in Order of Apparent Amount of Sickness, Most Prevalent Disease First.	Per Cent of Reports Stating Presence of, *d*	Av. Order of Prevalence when Pres. *e*
		BAY AND EASTERN DIV.*			CENTRAL DIVISION.*			SOUTHWESTERN DIV.*		
More Sickness than Av. for 28 Diseases.	1	Neuralgia	70	2.8	Neuralgia	65	2.6	Rheumatism	74	2.6
	2	Bronchitis	68	3.0	Rheumatism	58	2.6	Neuralgia	62	2.6
	3	Rheumatism	69	3.1	Bronchitis	51	2.7	Intermittent Fev.	44	2.5
	4	Consumption, Pul.	61	3.3	Remittent Fever	36	2.2	Bronchitis	48	2.9
	5	Intermittent Fever	48	2.8	Intermittent Fever	41	2.5	Diarrhea	33	2.7
	6	Diarrhea	45	3.3	Diarrhea	40	2.5	Influenza	28	2.5
	7	Influenza	34	2.8	Tonsillitis	42	2.7	Tonsillitis	44	3.4
	8	Tonsillitis	48	4.0	Influenza	27	2.2	Consumption, Pul.	46	3.7
	9	Whooping-cough	18	2.9	Consumption, Pul.	44	3.5	Typho-mal. Fever	26	3.0
	(10)				Average	21	2.9			
	10	Remittent Fever	33	3.8	Pneumonia	21	2.9	Remittent Fever	29	3.2
	(11)	Average	28	3.7						
Less.	11	Cholera Infantum	20	3.5	Measles	13	2.6	Pneumonia	31	3.4
	12	Pneumonia	30	4.2	Whooping-cough	11	2.8	Cer.-spinal Men.	1	2.0
	13	Cholera Morbus	20	3.8	Puerperal Fever	6	2.6	Puerperal Fever	7	2.3
	(14)							Average	23	3.1
	14	Pleuritis	23	4.2	Dysentery	15	3.1	Whooping-cough	20	3.0
	15	Erysipelas	23	4.3	Pleuritis	12	3.0	Scarlet Fever	10	2.8
		SOUTHERN CENTRAL DIV.*			SOUTHEASTERN DIVISION.*					
More Sickness than Av. for 28 Diseases.	1	Neuralgia	71	2.3	Bronchitis				74	2.1
	2	Rheumatism	76	2.9	Consumption, Pulmonary				74	2.4
	3	Bronchitis	61	2.6	Rheumatism				74	3.0
	4	Influenza	46	2.1	Neuralgia				56	3.1
	5	Intermittent Fever	48	2.6	Diarrhea				50	3.0
	6	Diarrhea	52	2.9	Influenza				29	2.3
	7	Tonsillitis	49	3.2	Tonsillitis				47	3.4
	8	Remittent Fever	37	3.3	Intermittent Fever				45	3.3
	9	Consumption, Pul.	42	4.5	Remittent Fever				34	3.6
	(10)	Average	25	3.5						
Less.	10	Pneumonia	26	4.3	Small-pox				2	1.9
	11	Cholera Morbus	14	3.5	Typho-malarial Fever				18	2.9
	(12)				Average				27	3.6
	12	Whooping-cough	18	4.2	Pneumonia				32	4.1
	13	Dysentery	19	4.5	Whooping-cough				20	3.5
	14	Pleuritis	18	4.7	Cholera Morbus				14	3.2
	15	Cholera Infantum	9	4.1	Dysentery				17	3.6

* The counties in each division are stated in Exhibit I., page 95.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." *d*, *e*. Foot-notes with these marks are on page 109.

EXHIBIT VIII.—*Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit X., and following Exhibits, relative to Sickness and Meteorological Conditions in 1889, also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind and Atmospheric Pressure, at each Station for which Observations of the given condition are included in the summary statements relative to that condition in said exhibit.*

Stations.* (Those of the U. S. Signal Service in Italics.)	Temperature.		Humidity.		Per Cent of Cloudiness.	Ozone.		Wind, Av. Velocity.	Atmospheric Pressure.		
	Av. Daily Range.	Average.	Relative.	Absolute.		Day.	Night.		Range. Monthly.	Range. Av. Daily.	Average.
Number of Stations Included in Average	16	13	9	9	11	8	8	7	12	12	12
Average	17.46	47.36	77	3.47	56	3.98	4.05	9.2	.946	.201	29.128
Marquette	14.87	.....	.....	.....	.....	.....	.....	8.8	.....	.....	.....
Gulliver Lake	18.87	40.94	84	3.05	59	.....	.....	.....	.948	.199	29.296
Manistee	12.88	.....	.....	.....	.....	.....	.....	8.3	.....	.....	.....
Traverse City	19.91	45.45	79	3.36	60	5.81	6.03	.....	.907	.195	29.317
Alpena	14.14	.....	.....	.....	.....	.....	.....	9.2	.....	.....	.....
Harrisville	.....	.....	.....	.....	60	4.23	4.51	.....	.998	.224	29.319
Port Austin	15.83	46.67	.....	.....	.....	4.01	4.62	.....	1.007	.223	29.340
Port Huron	15.17	.....	.....	.....	.....	.....	.....	11.0	.....	.....	.....
Thornville	15.92	48.61	77	3.63	53	3.34	3.82	.....	1.001	.207	28.986
Agr'l College	20.38	47.33	76	3.44	56	.....	.....	.....	.925	.188	29.062
Lansing, (S. B. of H.)	19.93	47.65	72	3.35	55	3.53	3.41	9.0	.918	.197	29.072
Otsego	.....	47.21	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ann Arbor	18.06	47.83	80	3.66	56	3.90	3.32	8.6	.930	.194	29.021
Battle Creek	17.39	51.13	.....	.....	54	.....	.....	.....	.984	.205	29.061
Kalamazoo	17.59	48.96	73	3.52	57	.....	.....	.....	.921	.190	29.004
Marshall	20.12	48.83	80	3.72	49	3.14	2.87	.....	.898	.193	29.013
Tecumseh	.....	47.54	.....	.....	.....	.....	.....	.....	.....	.....	.....
Birmingham	22.68	47.58	77	3.52	60	3.91	3.81	9.5	.921	.196	29.108
Detroit	15.59	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Observations of range of temperature were made with registering thermometers read and set at the Signal Service Stations as follows:—the maximum at the morning observation, the minimum at the evening observation, at 9 P. M. at Ann Arbor, and at 7 A. M. at other stations. For the ozone observations, the test-paper was exposed from 7 A. M. to 2 P. M. for the day observations, and from 9 P. M. to 7 A. M. for the night observations. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1889 and for previous years, in an article on Meteorological Conditions in Michigan in 1889, on pages 1-88 of this Report.

EXHIBIT IX.—*Showing Comparisons between the Averages of certain Meteorological Conditions at Stations in Michigan in 1889, with those in preceding Years. (Abstracted from Exhibit 9, page 29; Exhibit 12, page 35, Exhibit 16, page 40· Exhibit 18, page 43; Exhibit 23, page 52; Exhibit 27, page 60; Exhibits 29 and 30, page 64; Exhibit 31, page 71 Exhibit 34, page 85.*

Meteorological Conditions.		Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average Temperature	In 1889 higher than Av. for 12 years, 1877-88	1.45	8.34	.....	6.71	2.03	.50	.....	.....	.59	.29	.....	1.76	9.74
	Lower	.....	.....	4.71	.....	.....	.....	2.41	.09	.....	.....	5.31	.....	.....
Av. Daily Range of Temp.	In 1889 more than Av. for 10 years, 1879-88	.....	.....	.....	.....	.....	.....	.....	.54	1.52	1.79	.....	.....	.24
	Less	.76	2.47	.74	1.25	.61	1.44	2.68	.....	.....	.....	.28	2.77	.....
Absolute Humidity	In 1889 more than Av. for 12 years, 1877-88	.06	.42	.....	.36	.16	.01	0	.11	.....	.....	.....	.22	.78
	Less	.....	.....	.17	.....	.....	.....	.....	.....	.24	.05	.84	.....	.....
Relative Humidity	In 1889 more than Av. for 11 years, 1878-88	1	3	7	0	1	1	8	3	.....	.....	.....	5	1
	Less	.....	.....	.....	.....	.....	.....	.....	.....	4	1	3	.....	.....
Rainfall	In 1889 more than Av. for 12 years, 1877-88	.....	.27	.....	.....	.....	.86	.....	.....	.....	.....	.....	.....	.26
	Less	7.75	.....	.59	1.39	.91	.....	.15	.31	2.35	1.61	2.37	0	.....
Velocity of Wind	In 1889 more than Av. for 7 years, 1882-88	.....	.....	.2	.....	.....	.7	.....	.....	.....	.6	.....	.....	.1
	Less	.3	.9	.....	1.0	.7	.....	.5	.9	0	.....	.8	1.0	.....
Cloudiness	In 1889 more than Av. for 12 years, 1877-88	0	2	7	.....	3	6	21	.....	.....	.....	.....	4	.....
	Less	.....	.....	.....	10	.....	.....	.....	5	11	4	0	.....	13
Day Ozone	In 1889 more than Av. for 12 years, 1877-88	.78	.95	.66	.42	.52	.85	1.50	1.02	.93	1.03	.55	.51	.48
	Less	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Night Ozone	In 1889 more than Av. for 12 years, 1877-88	.72	0	.24	.11	.63	1.02	1.84	1.36	1.40	.99	.17	0	.37
	Less	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atmospheric Pressure	In 1889 greater than Av. for 12 years, 1877-88	.....	.....	.....	.....	.....	.....	.....	.....	.041	.....	.039	.....	.....
	Less	.034	.134	.018	.068	.021	.166	.011	.020	.....	.065	.....	.043	.040

[illegible]

[illegible] Exhibits and propositions similar to this are relative to bronchitis, but relating to other diseases, are given on the following pages. The propositions are differently stated for the summer diseases (beginning with the exhibit on cholera) and for the winter diseases (beginning with that on bronchitis), but they are not changed to fit the individual diseases under each class.

RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1. That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis, these conditions were **less** than the average for the year. In Exhibit X., page 131, the letter *a* marks exceptions to this proposition for the year 1889.

PROPOSITION 2. That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **greater**

* The remarks under this head are applicable, also, by changing the name of the diseases to diseases treated in Exhibits XII., XIV., XV., XVI., and XVII., on the following pages. The meteorological data are from places indicated in Exhibit VIII., page 126.

than the average for the year. In Exhibit X., page 131, the letter *b* marks exceptions to this proposition for months in 1889.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months when **more** than the average per cent of reports stated presence of bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of bronchitis was **less** than the average.

Proposition 3 also holds true in relation to pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis and pulmonary consumption, treated in Exhibits XII., XIV., XV., XVI., and XVII, on following pages.

What per cent of weekly reports received in 1889 stated presence of bronchitis is graphically represented by months in Diagram 1, page 97.

The evidence of exhibit X. confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877–89; also the average for 1877–88, and a comparison of 1889 with that average, are shown in Exhibit XI., page 130.

RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the averager per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibits XII.–XVII., on page 132 and the following pages, the letter *a* marks exceptions to this proposition for the year 1889.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibits XII.–XVII., on page 139 and following pages, the letter *b* marks exceptions to this proposition for the year 1889.

What per cent of the weekly reports received in 1889 stated presence of pneumonia is graphically represented by months in Diagram 1, page 97. What per cent of weekly reports received stated presence of pneumonia, and of the other diseases mentioned in the two preceding propositions by months in the years 1877–88, is stated in Exhibit XIII., page 134, where

are also given an average for those years and a comparison of 1889 with that average.

From Exhibit XIII., it may be seen that pneumonia was considerably less in 1889 than the average for twelve years, 1877–88, and also less in each month of 1889, except October, than for the corresponding months of the twelve years, 1877–88.

The average temperature was slightly higher in 1889, than the average for the twelve years, 1877–88. It was also higher in each month of 1889, except in February, June, July and October, than the average in corresponding months in the twelve years, 1877–88.

The absolute humidity was slightly higher in 1889, than in the average for the twelve years, 1877–88. It was also higher in each month of 1889, except February, August, September and October, than the average in corresponding months in the twelve years, 1877–88.

The relative humidity was more for the year and each month of the year 1889, except August, September and October, than the average for the twelve years, 1877–88.

EXHIBIT XI.—SICKNESS FROM BRONCHITIS, 1877–89.—*By Year and Months for each of the Eleven Years 1877–88 and for 1889; Stating on what per cent of the Weekly Reports received Bronchitis was reported present, and comparing the Per Cents for 1889, with the Averages for corresponding months in those Years.*

Years, Etc.	Annual Av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 12 years, 1877-88	61	75	76	76	70	61	53	43	41	48	55	65	70
1877	55	76	72	72	65	45	31	25	22	37	48	71	77
1878	64	77	75	74	71	65	56	41	45	55	60	73	81
1879	64	83	87	83	78	65	54	40	41	50	59	65	77
1880	64	81	84	82	68	59	57	44	45	46	57	67	72
1881	62	86	86	80	78	62	53	38	37	44	44	66	68
1882	65	73	70	75	74	70	62	51	44	57	59	71	71
1883	66	77	80	82	76	70	62	56	53	53	57	61	69
1884	61	71	71	71	65	59	56	49	47	50	56	69	70
1885	56	73	74	76	73	56	52	44	39	45	51	58	64
1886	56	71	69	71	65	57	45	40	37	41	51	61	65
1887	55	67	69	67	62	57	49	41	38	47	57	57	61
1888	59	63	76	74	68	63	55	41	39	49	59	59	65
1889	58	65	68	69	68	61	50	49	44	51	57	64	62
In 1889 **Greater** than Av. 1877-88	....	....	....	....	7	8	....	6	3	3	2	....	....
In 1889 **Less** than Av. 1877-88	3	10	8	1	....	....	3	....	....	....	....	1	8
In 1889 **Greater** than Av. 1886-8*	1	....	....	....	3	2	=	8	6	5	1	5	....
In 1889 **Less** than Av. 1886-8*	....	2	3	2	....	....	=	....	....	....	....	....	2

* This comparison is made because of change of plan of reports in May, 1885, as explained on pages 90-1.

EXHIBIT X.—BRONCHITIS.—*Stating for the Year and for each Month of the Year 1889, what Per Cent of the Weekly Reports of Sickness Stated Presence of Bronchitis, and what were the Meteorological Conditions as observed at Stations in Michigan.**

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Bronchitis. Per Cent of Weekly Reports Stating Presence of.	Bronchitis. Av. Order of Prevalence Where Present.‡	Temperature, F. Av. Daily Range by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute,—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Bronchitis.	Mar.	69	2.1	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	Feb.	68	2.2	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Apr.	68	2.4	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.238	a 29.116
	Jan.	65	2.2	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Nov.	64	2.6	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
	Dec.	62	2.2	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	May	61	2.5	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
Av.		58	2.7	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Bronchitis.	Oct.	57	2.9	16.98	b44.59	73	b 2.76	1.73	9.95	a 58	3.54	3.29	8.8	.898	a .211	a 29.228
	Sept.	51	3.5	a20.59	61.36	a 74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	June	50	2.7	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	July	49	2.9	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Aug.	44	3.7	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192

a An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was greater than the average for the year; and less in months when the same condition was less than the average. See proposition 1, relating to bronchitis, page 128.

b An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was less than the average for the year and less in months when the same condition was greater than the average for the year. See proposition 2, relating to bronchitis, page 128.

* How many stations, and what stations are represented in the statements for each meteorological subject may be seen by referring to Exhibit VIII., page 126, in which the stations are named, and a statement for the year 1889, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit VIII., is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological Conditions in Michigan in 1889, on pages 1-88 of this Report.

† Explanations of statements in these columns, and other statements relative to the prevalence, in 1889, of the diseases under consideration, may be found in Tables 2, pp. 103-117, and 4, pages 118-119, of this Report, and also in Diagrams 1 (p. 97), 2, 3, 4, 5 and 6, on following pages. When the per cent of reports stated for any disease is the same for two months or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

‡ Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

§ Calculated from readings of dry bulb and wet bulb thermometers.

‖ Calculated for 18 respirations per minute, of 20 cubic inches of air each.

¶ Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

** The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 A. M., 2 P. M., 9 P. M. of one day, and 7 A. M. of the following day, or at U. S. Signal Service Stations at 8 A. M., 8 P. M. and 8 A. M., seventy-fifth meridian time, as stated in the * foot-note on page 83.

EXHIBIT XII.—PNEUMONIA AND MEMBRANOUS CROUP.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Pneumonia and Membranous Croup, and what were the Meteorological Conditions as observed at Stations in Michigan.

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	PNEUMONIA. Per Cent of Weekly Reports Stating Presence of.	PNEUMONIA. Av. Order of Prevalence Where Present.††	Temperature, F. Av. Daily Range by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute,—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 2 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Pneumonia.	Feb.	45	3.5	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Mar.	44	3.5	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	Jan.	41	3.4	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Apr.	38	4.0	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Nov.	29	3.5	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
	May	29	3.9	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	Dec.	27	3.8	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
Av.		26	3.7	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Ct. of Pneumonia.	Oct.	23	3.7	16.98	b44.59	73	b 2.76	1.73	9.95	a 58	3.54	3.29	8.8	.898	a .211	a 29.228
	June	16	3.5	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Sept.	13	4.5	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	Aug.	12	4.8	a21.56	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
	July	11	3.6	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	MEMBRANOUS CROUP.															
More than Av. Per Ct. of Mem. Croup.	Jan.	5	3.8	a13.93	28 18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Mar.	4	3.6	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 28.089
	Dec.	4	4.9	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	Oct.	4	5.1	a16.98	44.59	a 73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
	Nov.	3	4.0	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
Av.		3	4.3	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Membranous Croup.	Feb.	3	5.0	17.32	b18.57	a 88	b 1.34	.84	10.84	a 70	a 4.15	a 4.29	a 10.7	a1.336	a .249	a 29.177
	Apr.	3	5.3	a18.74	b46.04	71	b 2.88	1.80	9.88	55	3.91	a 4.30	a 9.5	a1.016	a .233	29.116
	Sept.	2	3.8	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	May	2	4.6	a19.28	56.74	69	3.95	2.47	9.21	54	a 4.19	a 4.51	a 9.9	.658	.145	29.060
	June	1	2.0	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Aug.	1	2.8	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
	July	1	4.0	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104

*, †, ‡, §, ‖, ¶ **. For foot-notes with these marks, see Exhibit X., page 131.
a An exception to proposition 1, relating to Pneumonia and Membranous Croup, on page 129.
b An exception to proposition 2, relating to Pneumonia and Membranous Croup, on page 129.

DIAGRAM 2.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1889.

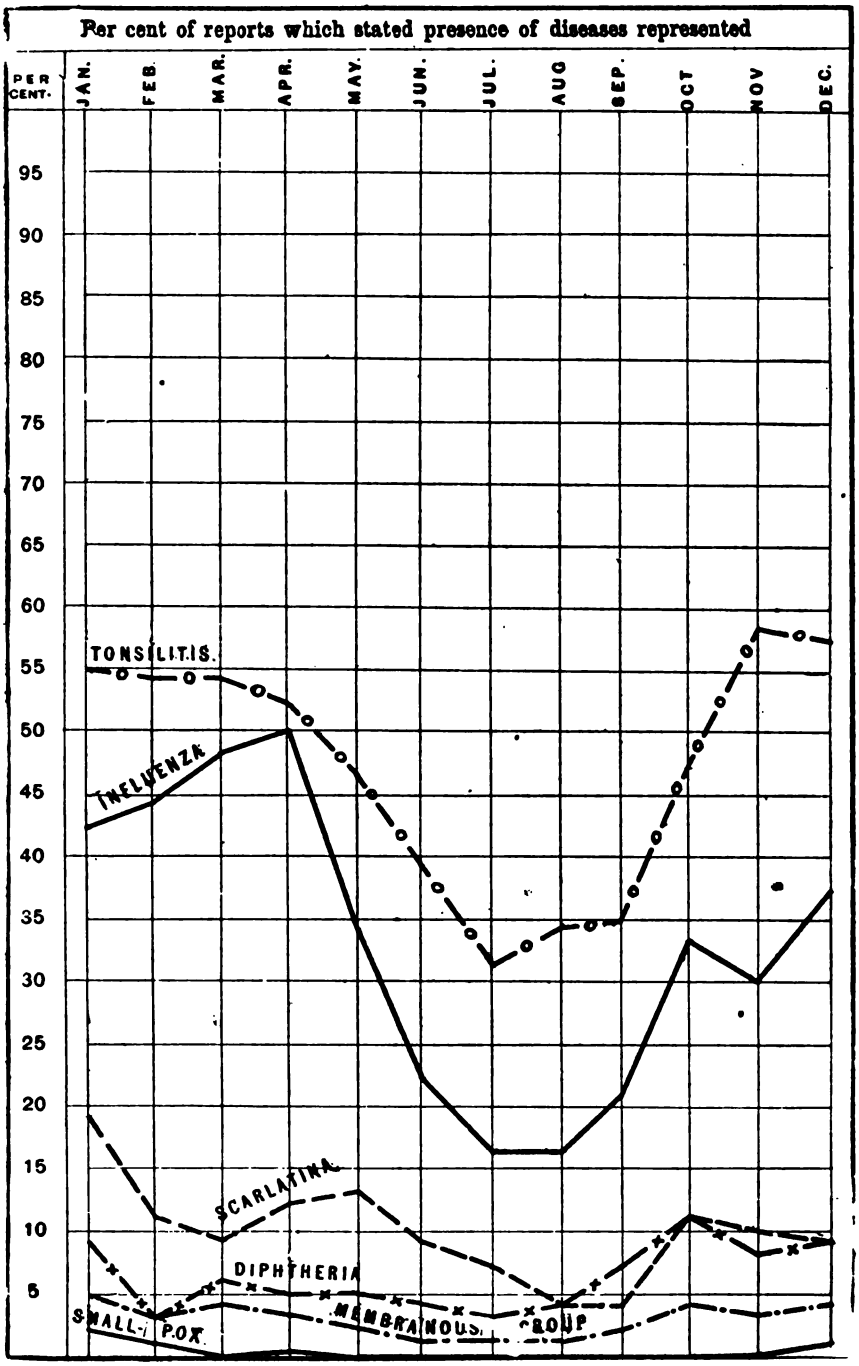


EXHIBIT XIII.—*By Year and Months for 1889 and for the preceding year, and an Average for the Eleven Years, 1877-88.* Stating on what Per Cent of the Weekly Reports received* PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, TONSILLITIS,* AND NEURALGIA* *were Reported Present, and Comparing the Per Cents for Months in 1889, with the Averages for Corresponding Months in those years.*†

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 12 years, 1877-88	35	56	61	59	52	39	24	15	13	16	21	32	43
	1888	30	42	51	54	44	40	24	13	10	15	17	24	33
	1889	26	41	45	44	38	29	16	11	12	13	23	29	27
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	2	..	..
	In 1889 **Less** than Av. 1877-88	9	15	16	15	14	10	8	4	1	3	..	3	16
Membranous Croup.	Av. 12 years, 1877-88	6	11	9	8	7	5	4	2	2	4	5	8	9
	1888	4	7	5	6	7	5	3	0.5	0.8	1	4	3	5
	1889	3	5	3	4	3	2	1	1	1	2	4	3	4
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1889 **Less** than Av. 1877-88	3	6	6	4	4	3	3	1	1	2	1	5	5
Diphtheria.	Av. 12 years, 1877-88	19	25	14	19	18	16	13	13	14	17	24	26	25
	1888	7	9	10	7	8	7	5	5	6	7	7	5	6
	1889	6	9	3	6	5	5	4	3	4	7	11	8	9
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1889 **Less** than Av. 1877-88	13	16	11	13	13	11	9	10	10	10	13	18	16
Rheumatism.	Av. 12 years, 1877-88	68	73	73	75	75	71	68	61	57	61	67	71	73
	1888	66	66	73	74	70	70	69	58	53	61	70	68	69
	1889	65	66	63	66	71	70	69	64	56	60	65	64	67
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	1	3	..	..	..	..	..
	In 1889 **Less** than Av. 1877-88	3	7	10	9	4	1	..	..	1	1	2	7	6
Influenza.	Av. 12 years, 1877-88	39	54	60	58	51	37	27	19	20	29	32	40	47
	1888	32	43	56	53	41	32	24	13	12	19	28	31	40
	1889	32	42	44	48	50	34	22	16	16	21	38	30	37
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	1	..	..
	In 1889 **Less** than Av. 1877-88	7	12	16	10	1	3	5	3	4	8	..	10	10
Scarlet Fever.	Av. 12 years, 1877-88	16	21	21	22	20	18	15	12	11	12	15	16	17
	1888	9	15	11	9	14	11	9	6	4	6	9	9	13
	1889	10	19	11	9	12	13	9	7	4	4	11	10	9
	In 1889 **Greater** than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1889 **Less** than Av. 1877-88	6	2	10	13	8	5	6	5	7	8	4	6	8
Tonsillitis.	Av. 10 years, 1879-88	48	59	61	61	53	46	40	31	31	36	44	54	59
	1888	41	55	55	60	50	41	32	24	21	27	35	49	49
	1889	46	55	54	54	52	46	39	31	34	35	47	58	57
	In 1889 **Greater** than Av. 1879-88	..	..	..	..	..	=	..	=	3	..	3	4	..
	In 1889 **Less** than Av. 1879-88	2	4	7	7	1	=	1	=	..	1	..	..	2
Neuralgia.	Av. 10 years, 1879-88	66	69	71	74	72	67	64	60	58	60	63	67	69
	1888	62	66	68	71	66	62	56	57	58	51	62	64	62
	1889	63	64	65	63	70	65	63	60	55	58	60	66	69
	In 1889 **Greater** than Av. 1879-88	..	..	..	..	..	..	..	=	..	..	..	..	..
	In 1889 **Less** than Av. 1879-88	3	5	6	11	2	2	1	=	3	2	3	1	..

* The average line for tonsillitis and neuralgia includes only the ten years, 1879-1888.

† Other statements for 1889, and months in 1889, relative to these diseases are given in Table 2, pages 108-117, and in Exhibits XII., XIV., XV., and XVI., pages 132, 136, 137, and 138, where are also given for convenient comparison statements of coincident meteorological conditions.

The lines for 1889 in Exhibit XIII. are graphically represented in Diagrams 1, page 97, 2, page 133, and 4 on page 141.

In Diagram 2, page 133, the rise in influenza in October is apparently explained by the very unusual rise in the north and northeast winds, shown on pages 74 and 75.

DIAGRAM 3 –WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1889.

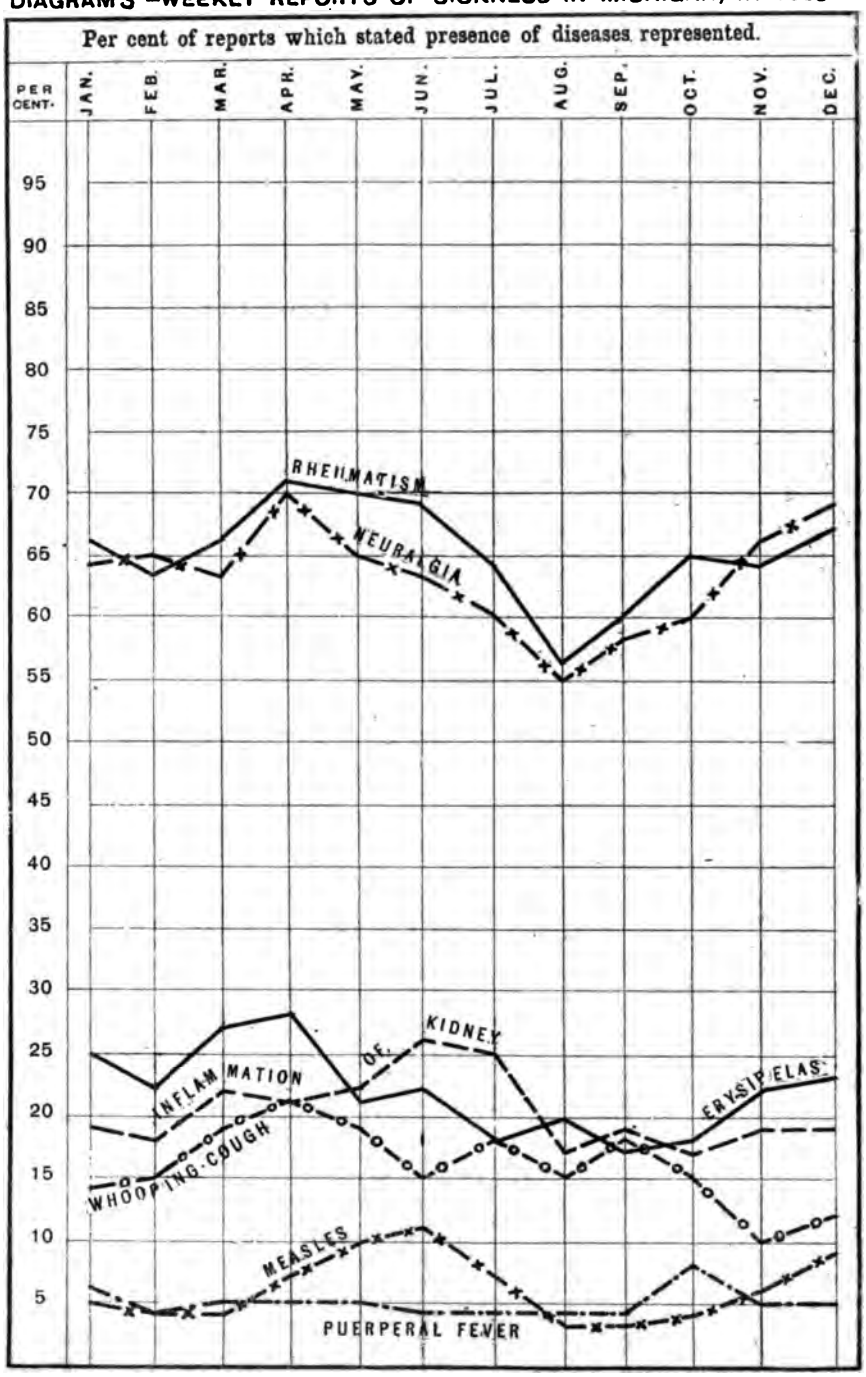


EXHIBIT XIV.—DIPHTHERIA AND TONSILLITIS.—*Stating for the Year and for each Month of the Year 1889, what Per Cent of the Weekly Reports of Sickness Stated Presence of Diphtheria and Tonsillitis and what were the Meteorological Conditions as observed at Stations in Michigan.

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	DIPHTHERIA. Per Cent of Weekly Reports Stating Presence of.	DIPHTHERIA. Average Order of Prevalence Where Present.†‡	Temperature, F. Average Daily Range by Registering Thermometers.	Temperature, F. Average of three Daily Observations.	Humidity of Air § Av. of 3 Daily Observations. Relative—Per Cent of Saturation.	Humidity of Air § Av. of 3 Daily Observations. Absolute—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces. Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by One Person in 24 Hours. Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°. Day Observations, 7 A. M. to 2 P. M.	Ozone—Relative Scale of 10°. Night Observations, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour by Anemometer.	Atmospheric Pressure, Inches. Reduced to 32° F. Range. Monthly, and for Year.	Atmospheric Pressure, Inches. Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches. Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Diphtheria.	Oct.	11	3.5	a16.98	44.59	a73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
	Dec.	9	4.2	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	Jan.	9	4.8	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Nov.	8	4.0	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
	Sept.	7	4.8	20.59	b61.36	a74	b 4.82	3.01	8.67	a 42	a 3.97	a 3.70	a 9.1	a .798	a .164	29.131
Average		6	4.3	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Diphtheria.	Mar.	6	4.9	16.74	b35.83	77	b 2.13	1.93	9.75	49	3.95	a 4.15	a 9.4	.759	.161	29.089
	Apr.	5	3.3	a18.74	b46.04	71	b 2.88	1.80	9.88	55	3.91	a 4.30	a 9.5	a1.016	a .233	29.116
	May	5	4.2	a19.28	56.74	69	3.95	2.47	9.21	54	a 4.19	a 4.51	a 9.9	.658	.145	29.060
	Aug.	4	3.9	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	a 4.03	7.7	.520	.115	a 29.192
	June	4	4.7	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	July	3	4.2	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	1.31	29.104
	Feb.	3	5.8	17.32	b18.57	a 88	b1.34	.84	10.84	a 70	a 4.15	a 4.29	a 10.7	a1.336	a .249	a 29.177
	TONSILLITIS.															
More than Av. Per Cent of Tonsillitis.	Nov.	58	2.9	a11.81	37.95	84	2.52	1.58	10.10	72	3.62	a 3.36	9.7	1.118	.249	29.135
	Dec.	57	2.9	a13.41	36.76	84	2.43	1.52	10.16	54	a 3.83	4.05	11.0	1.180	.331	29.141
	Jan.	55	3.1	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Feb.	54	3.1	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Mar.	54	3.3	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	Apr.	52	3.4	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Oct.	47	3.2	a16.98	44.59	a 73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
	May	46	3.1	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
Average		46	3.3	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Tonsillitis.	June	39	2.9	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Sept.	35	3.8	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	Aug.	34	4.1	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
	July	31	3.7	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Diphtheria and Tonsillitis, on page 129.
b An Exception to Proposition 2, relating to Diphtheria and Tonsillitis, on page 129.

EXHIBIT XV.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Influenza and Scarlet Fever, and what were the Meteorological Conditions as observed at Stations in Michigan.

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Influenza: Per Cent of Weekly Reports Stating Presence of.	Influenza: Average Order of Prevalence where Present.††	Temperature, F.: Average Daily Range by Registering Thermometers.	Temperature, F.: Average of three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations: Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations: Absolute—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces: Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces: Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°: Day Observation, 7 A. M. to 2 P. M.	Ozone—Relative Scale of 10°: Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F.: Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F.: Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F.: Average Pressure.
More than Av. Per Cent of Influenza.	Apr.	50	2.3	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.283	a 29.116
	Mar.	48	2.3	16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	Feb.	44	2.2	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Jan.	42	2.3	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Dec.	37	1.9	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	May	34	2.3	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	Oct.	33	2.6	a16.98	b44.59	a 73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
Av.		32	2.4	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Ct. of Influenza.	Nov.	30	2.1	11.81	b37.95	a 84	b 2.52	1.58	10.10	a 72	3.62	3.36	a 9.7	a1.118	a .249	a 29.135
	June	22	2.7	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Sept.	21	3.0	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	July	16	2.5	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Aug.	16	3.2	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
	SCARLET FEVER.															
More than Av. Per Ct. of Scarlatina.	Jan.	19	3.5	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	May	13	3.5	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	Apr.	12	4.2	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Oct.	11	3.7	a16.98	44.59	a 73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
	Feb.	11	4.4	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
Av.		10	3.9	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	9.46	2.01	29.128
Less than Av. Per Cent of Scarlatina.	Nov.	10	4.3	11.81	b37.95	a 84	b 2.52	1.58	10.10	a 72	3.62	3.36	a 9.7	a1.118	a .249	a 29.135
	June	9	3.1	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Dec.	9	3.9	13.41	b36.76	a 84	b 2.43	1.52	10.16	a 64	3.83	4.05	a 11.0	a1.180	a .331	a 29.141
	Mar.	9	5.6	16.74	b35.83	77	b 2.13	1.93	9.75	49	3.95	a 4.15	a 9.4	.759	.161	29.089
	July	7	3.2	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Aug.	4	3.5	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
	Sept.	4	4.7	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Influenza and Scarlet Fever, on page 129.
b An Exception to Proposition 2, relating to Influenza and Scarlet Fever, on page 129.

EXHIBIT XVI.—RHEUMATISM AND NEURALGIA.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Rheumatism and Neuralgia, and what were the Meteorological Conditions as Observed at Stations in Michigan.**

Rheumatism.	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence where Present.†‡	Temperature, F. Average Daily Range by Registering Thermometers.	Temperature, F. Average of three Daily Observations.	Humidity of Air,§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air,§ Av. of 3 Daily Observations. Absolute — Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone — Relative Scale of 10.° Day Observation, 7 A. M. to 2 P. M.	Ozone — Relative Scale of 10.° Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly, and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Rheumatism.	Apr.	71	3.0	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	May.	70	2.4	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	June.	69	2.4	18.00	b63.05	80	b 5.33	3.33	8.35	68	4.61	5.00	a 7.5	a .790	a .133	a 29.100
	Dec.	67	2.6	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	Jan.	66	2.7	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Mar.	66	2.9	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
Av.		65	2.8	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Rheumatism.	Oct.	65	3.0	16.98	b44.59	73	b 2.76	1.73	9.95	a 58	3.54	3.29	8.8	.898	a .211	a 29.228
	July.	64	2.8	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Nov.	64	2.8	11.81	b37.95	a 84	b 2.52	1.58	10.10	a 72	3.62	3.36	a 9.7	a1.118	a .249	a 29.135
	Feb.	63	3.0	17.32	b18.57	a 88	b 1.34	.84	10.84	a 70	a 4.15	a 4.29	a 10.7	a1.336	a .249	a 29.177
	Sept.	60	3.2	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	Aug.	56	3.4	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
Neuralgia.																
More than Average Per Cent of Neuralgia.	Apr.	70	2.6	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Dec.	69	2.4	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	Nov.	66	2.4	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
	May.	65	2.3	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	Feb.	65	2.7	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Jan.	64	2.5	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	June.	63	2.3	18.00	b63.05	80	b 5.33	3.33	8.35	68	4.61	5.00	a 7.5	a .790	a .133	a 29.100
	Mar.	63	2.4	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
Av.		63	2.6	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Ct. of Neuralgia.	Oct.	60	2.6	16.98	b44.59	73	b 2.76	1.73	9.95	a 58	3.54	3.29	8.8	.898	a .211	a 29.228
	July.	60	2.7	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Sept.	58	3.2	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	Aug.	55	3.4	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192

*. †, ‡, §, ‖, ¶, **. For foot-notes with these marks, see Exhibit X, page 131.
a An Exception to Proposition 1, relating to Rheumatism and Neuralgia, on page 129.
b An Exception to Proposition 2, relating to Rheumatism and Neuralgia, on page 129.

EXHIBIT XVII.—PULMONARY CONSUMPTION AND PLEURITIS.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Pulmonary Consumption and Pleuritis, and what were the Meteorological Conditions as observed at Stations in Michigan.

CONSUMPTION.	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.†‡	Temperature, F. Av. Daily Range, by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute — Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled. ‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Average Per Cent of Consumption.	Oct.	52	3.5	a16.98	44.59	a 73	2.76	1.73	9.95	58	a 3.54	a 3.29	a 8.8	a .898	.211	29.228
	Dec.	51	3.2	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
	Mar.	50	3.5	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	April	50	3.7	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Sept.	50	3.8	20.59	b61.36	a 74	b 4.82	3.01	8.67	a 42	a 3.97	a 3.70	a 9.1	a .798	a .164	29.131
	Jan.	49	3.2	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Feb.	49	3.6	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	Nov.	49	3.6	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
Av.		48	3.5	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Consumption.	June	47	3.1	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	July	47	3.3	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	May	46	3.7	a19.28	56.74	69	3.95	2.47	9.21	54	a 4.19	a 4.51	a 9.9	.658	.145	29.060
	Aug.	46	3.8	a21.50	68.58	70	5,52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192
PLEURITIS.																
More than Av. Per Cent of Pleuritis.	Mar.	27	4.5	a16.74	35.83	77	2.13	1.93	9.75	a 49	a 3.95	4.15	9.4	a .759	a .161	a 29.089
	April	24	4.5	18.74	46.04	a 71	2.88	1.80	9.88	a 55	a 3.91	4.30	9.5	1.016	.233	a 29.116
	Jan.	23	4.0	a13.93	28.18	85	1.77	1.11	10.57	72	4.31	a 3.89	10.2	1.622	.289	a 29.068
	Feb.	20	4.0	a17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	1.336	.249	29.177
	May	17	3.5	19.28	b56.74	a 69	b 3.95	2.47	9.21	a 54	4.19	4.51	9.9	a .658	a .145	a 29.060
	Nov.	17	3.6	a11.81	37.95	84	2.52	1.58	10.10	72	a 3.62	a 3.36	9.7	1.118	.249	29.135
	Dec.	17	3.8	a13.41	36.76	84	2.43	1.52	10.16	64	a 3.83	4.05	11.0	1.180	.331	29.141
Av.		17	4.0	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Ct. of Pleuritis.	June	14	4.0	a18.00	63.05	a 80	5.33	3.33	8.35	a 68	a 4.61	a 5.00	7.5	.790	.133	29.100
	Oct.	13	4.2	16.98	b44.59	73	b 2.76	1.73	9.95	a 58	3.54	3.29	8.8	.898	a .211	a 29.228
	July	12	3.5	a21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	.588	.131	29.104
	Sept.	11	4.9	a20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	.798	.164	a 29.131
	Aug.	10	3.8	a21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	.520	.115	a 29.192

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks, see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Consumption and Pleuritis, on page 129.
b An Exception to Proposition 2, relating to Consumption and Pleuritis, on page 129.

EXHIBIT XVIII.—SICKNESS FROM CONSUMPTION.—1878-88.—*By Year and Months for each of the Eleven Years 1878-88, Stating on what Per Cent of the Weekly Reports received* CONSUMPTION *was Reported Present, and Comparing the Per Cents for 1889, with the Averages for Corresponding Months in those Years.*

Years, Etc.	Annual Av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average for 11 years, 1878-88*	62	62	63	65	66	63	62	59	56	57	60	61	61
1877*	52	50	47	47	53	49	50	43	35	38	34	68	65
1878	71	67	72	76	75	72	68	68	65	70	73	73	71
1879	70	71	71	69	77	74	73	69	67	67	69	67	64
1880	68	65	69	70	72	70	69	66	62	66	66	68	70
1881	71	74	76	73	76	69	68	67	67	70	73	74	67
1882	66	66	68	66	66	69	66	67	63	63	65	62	65
1883	61	69	66	66	65	62	61	59	55	57	58	58	60
1884	63	56	61	66	70	67	65	63	63	63	65	61	58
1885	58	60	68	71	69	58	61	56	52	54	55	56	56
1886	55	61	58	60	61	60	55	51	52	48	51	55	54
1887	51	53	54	61	61	54	48	48	47	45	48	47	50
1888	49	50	51	52	47	53	56	51	49	44	43	44	48
1889	48	49	49	50	50	46	47	47	46	50	52	49	51
In 1889 **Greater** than Av. 1878-88	----	----	----	----	----	----	----	----	----	----	----	----	----
In 1889 **Less** than Av. 1878-88	14	13	14	15	16	17	15	12	10	7	8	12	10
In 1889 **Greater** than Av. 1878-88†	----	----	----	----	----	----	----	----	----	4	5	=	=
In 1889 **Less** than Av. 1878-88	4	6	5	8	6	10	6	3	3	----	----	=	=

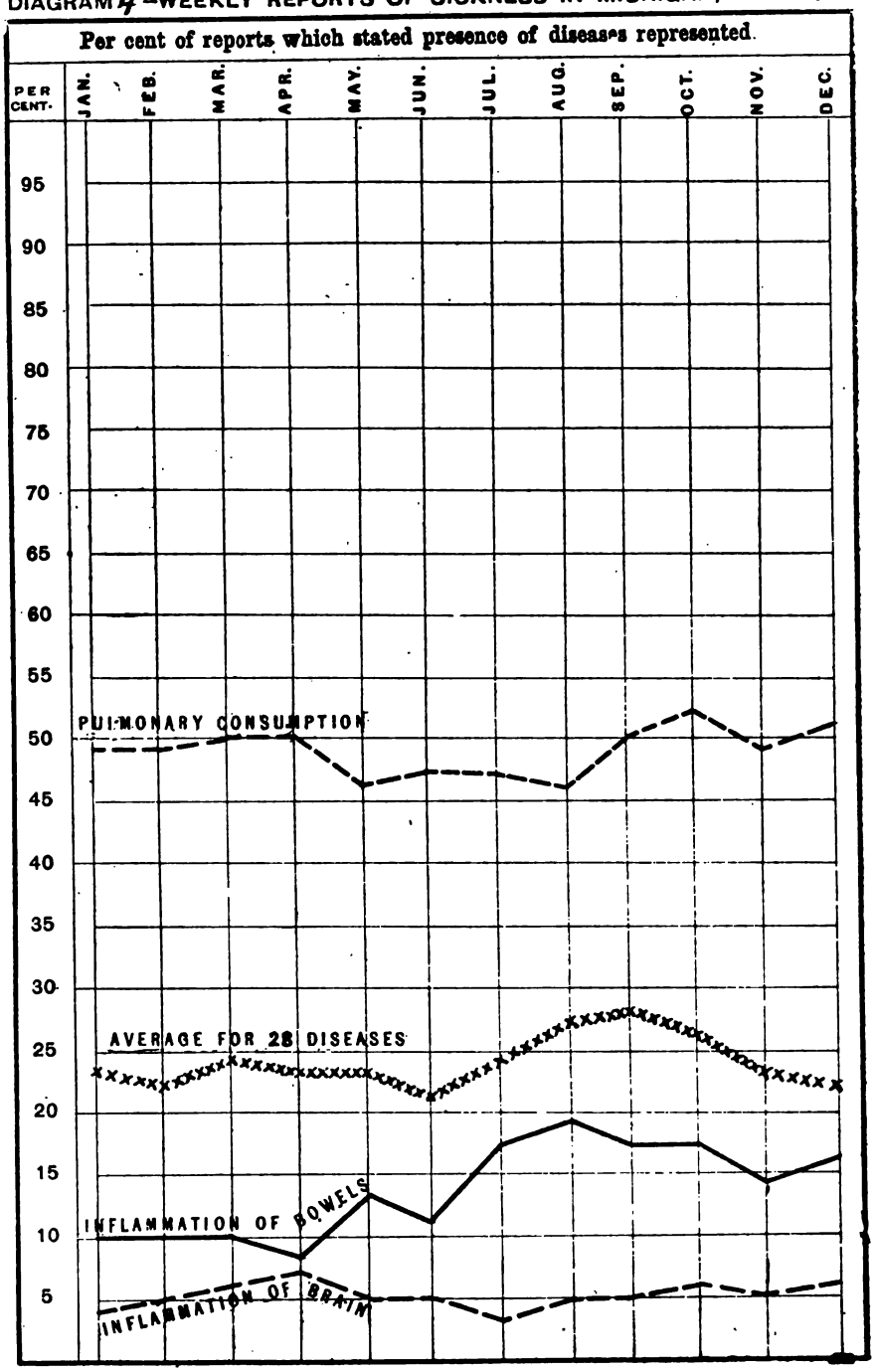
* As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.
† This comparison is made because of change of plan of reports in May, 1885, as explained on pages 90-1.

RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit XIX., page 144, the letter *a* marks exceptions to this proposition for the year 1889.

Explanations of propositions 1 and 2 are given on page 142, and a summary of the evidence in Exhibit XIX. is given in Exhibit XXV., on a following page.

DIAGRAM 4.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1889.



PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit XIX., page 144, the letter *b* marks exceptions to this proposition for 1889.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles and whooping-cough, treated in Exhibits XIX., XXI., XXII., and XXIII., page 144, and following pages.

On what per cent of the weekly reports received, by months in the twelve years, 1877–1888, the eight foregoing diseases were reported present is stated in Exhibit XX., page 145. In Diagram I., page 97, is graphically represented by months what per cent of the reports in each month in 1889 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1889, was in the months of August, September, July and October.

As shown by Exhibit XX., the reports indicate an increased prevalence of diarrhea in the year 1889. Compared with the year 1888, there was a slightly decreased prevalence of diarrhea in February and March, and in every other month except in April there was a marked increase. In April it was the same.

Compared with the corresponding months in the average for the twelve years, 1887–1888, the per cent of reports of diarrhea was slightly more in October, 1889. In January, March and August the per cent was the same, and for every other month of the year slightly less.

The average temperature for the year 1889 was slightly higher than the average for 1877–1888. It was also higher for each month of the year, except in February, June, July and October, than the average for corresponding months in the twelve years, 1877–1888. The absolute humidity was slightly greater for the year and for each month of the year, except February, August, September and October, than the average for 1877–1888. The relative humidity was slightly greater for the year 1889, and for each month of the year, except in August, September and October, than the average for the eleven years, 1878–1888.

RELATIONS OF CHOLERA INFANTUM AND OTHER "WARM WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping cough), the average daily range of temperature, the average

daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit XIX., page 144, the letter *a* marks exceptions to this proposition for the year 1889.

Explanations of propositions 1 and 2 are given on page 142, and a summary of the evidence of Exhibit XIX. is given in Exhibit XXV., on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibit XIX., page 144, the letter *b* marks exceptions to this proposition for 1889.

What per cent of all the weekly reports of sickness in each month in 1889 stated the presence of cholera infantum is graphically represented by months in Diagram 1, page 97. What per cent of the reports received by months in the twelve years 1877–88, stated presence of cholera infantum and of the other diseases mentioned in Propositions 1 and 2, is stated in Exhibit XX., page 145.

Cholera infantum was more prevalent during the hot months and in June and October,—August, September and July being the months in 1889 in which more than the average sickness from this disease was reported.

EXHIBIT XIX.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Diarrhea and Cholera Infantum, and what were the Meteorological Conditions as observed at Stations in Michigan.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.†‡	Temperature, F. Av. Daily Range, by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute — Grains of Vapor In a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours. Troy Ounces. Inhaled.‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours. Troy Ounces. Exhaled in Excess of that Inhaled.¶	Averages Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
DIARRHEA.															
More than Av. Per Cent of Diarrhea.															
Aug.	85	1.8	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	*a* .520	*a* .115	29.192
Sept.	77	1.7	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	*a* .798	*a* .164	29.131
July	68	2.2	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	*a* .588	*a* .131	*a* 29.104
Oct.	56	2.9	*a*16.98	*a*44.59	73	*a* 2.76	1.73	9.95	*b* 58	3.54	3.29	8.8	*a* .898	.211	29.228
Av.	45	2.8	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Average Per Cent of Diarrhea.															
June	37	2.9	*a*18.00	*a*63.05	80	*a* 5.33	3.33	8.35	68	4.61	5.00	*b* 7.5	.790	.133	29.100
Nov.	34	3.4	11.81	37.95	84	2.52	1.58	10.10	72	*b* 3.62	*b* 3.36	9.7	*a*1.118	*a* .249	*a* 29.135
May	33	3.0	*a*19.28	*a*56.74	69	*a* 3.95	2.47	9.21	*b* 54	4.19	4.51	9.9	.658	.145	29.060
Mar.	29	3.9	16.74	35.83	77	2.13	1.93	9.75	*b* 49	*b* 3.95	4.15	9.4	.759	.161	29.089
Apr.	29	4.2	*a*18.74	46.04	*b* 71	2.88	1.80	9.88	*b* 55	*b* 3.91	4.30	9.5	*a*1.016	*a* .233	29.116
Dec.	27	3.4	13.41	36.76	84	2.43	1.52	10.16	64	*b* 3.83	4.05	11.0	*a*1.180	*a* .331	*a* 29.141
Jan.	27	3.7	13.93	28.18	85	1.77	1.11	10.57	72	4.31	*b* 3.89	10.2	*a*1.622	*a* .289	29.068
Feb.	25	4.1	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	*a*1.336	*a* .249	*a* 29.177
CHOLERA INFANTUM.															
More than Av. Pr. Ct. of Cholera Infantum.															
Aug.	44	3.2	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	*a* .520	*a* .115	29.192
Sept.	40	3.4	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	*a* .798	*a* .164	29.131
July	23	3.1	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	*a* .588	*a* .131	*a* 29.104
Av.	11	3.4	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Average Per Cent of Cholera Infantum.															
Oct.	7	4.0	16.98	44.59	*b* 73	2.76	1.73	9.95	58	*b* 3.54	*b* 3.29	*b* 8.8	.898	*a* .211	*a* 29.228
June	4	3.2	*a*18.00	*a*63.05	80	*a* 5.33	3.33	8.35	68	4.61	5.00	*b* 7.5	.790	.133	29.100
Jan.	2	4.0	13.93	28.18	85	1.77	1.11	10.57	72	4.31	*b* 3.89	10.2	*a*1.622	*a* .289	29.068
Nov.	2	5.0	11.81	37.95	84	2.52	1.58	10.10	72	*b* 3.62	*b* 3.36	9.7	*a*1.118	*a* .249	*a* 29.135
Mar.	1	2.0	16.74	35.83	77	2.13	1.93	9.75	*b* 49	*b* 3.95	4.15	9.4	.759	.161	29.089
Apr.	1	3.0	*a*18.74	46.04	*b* 71	2.88	1.80	9.88	*b* 55	*b* 3.91	4.30	9.5	*a*1.016	*a* .233	29.116
Feb.	1	3.5	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	*a*1.336	*a* .249	*a* 29.177
May	1	5.6	*a*19.28	*a*56.74	*b* 69	*a* 3.95	2.47	9.21	*b* 54	4.19	4.51	9.9	.658	.145	29.060
Dec.	1	5.7	13.41	36.76	84	2.43	1.52	10.16	64	*b* 3.83	4.05	11.0	*a*1.180	*a* .331	*a* 29.141

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X., on page 131.
a An Exception to Proposition 1, relating to Diarrhea and Cholera Infantum, on pages 142-3.
b An Exception to Proposition 2, relating to Diarrhea and Cholera Infantum, on pages 142-3.

EXHIBIT XX.—*By Year and Months for 1889 and for the preceding year, and an Average for the Eleven Years 1877-88. Stating on what Per Cent of the Weekly Reports received* DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES AND WHOOPING-COUGH *were Reported Present, and Comparing the Per Cents for 1889, with the Averages for Corresponding Months in those years.**

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 12 years, 1877-88	47	27	28	29	32	36	45	72	85	79	54	35	28
	1888	41	23	26	31	29	30	35	60	78	73	37	31	25
	1889	45	27	25	29	29	33	37	68	85	77	56	34	27
	In 1889 Greater than Av. 1877-88	..	=	..	=	..	..	..	..	=	..	2	..	..
	In 1889 Less than Av. 1877-88	2	=	3	=	3	3	8	4	=	2	..	1	1
Cholera Infantum.	Av. 12 years, 1877-88	13	2	2	2	2	3	11	31	47	35	13	4	2
	1888	11	1	0.7	2	2	3	9	23	40	29	7	2	3
	1889	11	2	1	1	1	1	4	23	44	40	7	2	1
	In 1889 Greater than Av. 1877-88	..	=	..	..	..	..	..	..	..	5	..	..	..
	In 1889 Less than Av. 1877-88	2	=	1	1	1	2	7	8	3	..	6	2	1
Intermittent Fever.	Av. 12 years, 1877-88	68	55	57	60	68	73	75	76	76	76	74	65	40
	1888	45	40	41	45	45	46	44	47	46	48	48	43	38
	1889	43	36	33	34	48	41	44	50	51	50	47	42	39
	In 1889 Greater than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1889 Less than Av. 1877-88	25	19	24	26	20	32	31	26	25	26	27	23	1
Remittent Fever.	Av. 12 years, 1877-88	46	38	37	39	42	44	45	48	55	57	55	46	57
	1888	34	31	35	32	31	33	30	28	41	47	39	33	30
	1889	30	26	22	24	30	22	25	30	35	41	42	30	26
	In 1889 Greater than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1889 Less than Av. 1877-88	16	12	15	15	12	22	20	18	20	16	13	16	31
Typhoid Fever.	Av. 12 years, 1877-88	12	11	8	6	6	5	6	7	13	20	21	20	14
	1888	10	10	7	6	5	4	5	7	12	18	16	12	10
	1889	10	8	5	3	3	4	5	5	11	19	25	19	12
	In 1889 Greater than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	4	..	..
	In 1889 Less than Av. 1877-88	2	3	3	3	3	1	1	2	1	1	..	1	2
Typho-malarial Fever.	Av. 12 years, 1877-88	21	16	15	13	12	11	12	15	24	38	41	31	21
	1888	15	11	10	8	11	10	11	7	16	26	31	24	15
	1889	16	12	9	10	13	9	8	11	22	31	33	15	12
	In 1889 Greater than Av. 1877-88	..	..	..	..	1	..	..	..	..	..	..	..	..
	In 1889 Less than Av. 1877-88	5	4	6	3	..	2	4	4	2	7	8	16	9
Measles.	Av. 12 years, 1877-88	13	11	14	17	23	26	22	14	7	5	5	6	7
	1888	16	16	25	28	35	37	30	10	3	3	4	2	3
	1889	6	5	4	4	7	10	11	7	3	3	4	6	9
	In 1889 Greater than Av. 1877-88	..	..	..	..	..	..	..	..	..	..	..	=	2
	In 1889 Less than Av. 1877-88	7	6	10	13	16	16	11	7	4	2	1	=	..
Whooping-cough.	Av. 12 years, 1877-88	19	19	19	19	17	18	19	21	21	20	17	18	18
	1888	9	9	11	11	11	11	9	8	7	9	8	8	12
	1889	16	14	15	19	21	19	15	18	15	18	15	10	12
	In 1889 Greater than Av. 1877-88	..	..	..	..	=	4	1	..	..	..	..	..	..
	In 1889 Less than Av. 1877-88	3	5	4	=	..	..	4	3	6	2	2	8	6

* Other statements for 1889, and months in 1889, relative to these diseases, are given in Table 2, pages 108-117, and in Exhibits XII., XIV., XV., and XVI., pages 132, 136, 137, and 138, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1888 are graphically represented in Diagrams 1, page 97; 3, page 135; and 4, page 141.

EXHIBIT XXI.—INTERMITTENT FEVER AND REMITTENT FEVER.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Intermittent and Remittent Fever, and what were the Meteorological Conditions as observed at Stations in Michigan.

INTERMITTENT FEVER.	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present,†‡	Temperature, F. Av. Daily Range, by Registering Thermometers,	Temperature, F. Average of Three Daily Observations.	Humidity of Air,§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air,§ Av. of 3 Daily Observations. Absolute,—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled, ‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Intermittent Fever.	Aug.	51	2.5	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	a .520	a .115	29.192
	July	50	2.3	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	a .588	a .131	a 29.104
	Sept.	50	2.8	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	a .798	a .164	29.131
	April	48	3.8	18.74	a46.04	71	a 2.88	1.80	9.88	55	3.91	b 4.30	b 9.5	1.016	.233	a 29.116
	Oct.	47	2.3	a16.98	a44.59	73	a 2.76	1.73	9.95	b 58	3.54	3.29	8.8	a .898	a .211	29.228
	June	44	2.1	18.00	63.05	b 80	5.33	3.33	8.35	b 68	b 4.61	b 5.00	7.5	a .790	a .133	a 29.100
Av.		48	2.6	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Intermittent Fever.	Nov.	42	2.4	11.81	37.95	84	2.52	1.58	10.10	72	b 3.62	b 3.36	9.7	a1.118	a .249	a 29.135
	May	41	2.4	a19.28	a56.74	b 69	a 3.95	2.47	9.21	b 54	4.19	4.51	9.9	.658	.145	29.060
	Dec.	39	2.6	13.41	36.76	84	2.43	1.52	10.16	64	b 3.83	4.05	11.0	a1.180	a .331	a 29.141
	Jan.	36	2.9	13.93	28.18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	Mar.	34	3.2	16.74	35.83	77	2.13	1.93	9.75	b 49	b 3.95	4.15	9.4	.759	.161	29.089
	Feb.	33	3.1	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177
REMITTENT FEVER.																
More than Av. Per Ct. of Remittent Fever.	Oct.	42	2.9	a16.98	a44.59	73	a 2.76	1.73	9.95	b 58	3.54	3.29	8.8	a .898	.211	29.228
	Sept.	41	3.1	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	a .798	a .164	29.131
	Aug.	35	3.2	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	a .520	a .115	29.192
	Nov.	30	2.8	a11.81	a37.95	b 84	a 2.52	1.58	10.10	b 72	3.62	3.36	b 9.7	1.118	.249	29.135
	July	30	3.0	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	a .588	a .131	a29.104
Av.		30	3.2	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Remittent Fever.	April	30	3.6	a15.74	46.04	b 71	2.88	1.80	9.88	b 55	b 3.91	4.30	9.5	a1.016	a .233	29.116
	Jan.	26	3.2	13.93	28.18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	Dec.	26	3.4	13.41	36.76	84	2.43	1.52	10.16	64	b 3.83	4.05	11.0	a1.180	a .331	a 29.141
	June	25	2.7	a18.00	a63.05	80	a 5.33	3.33	8.35	68	4.61	5.00	b 7.5	.790	.133	29.100
	Mar.	24	3.6	16.74	35.83	77	2.13	1.93	9.75	b 49	b 3.95	4.15	9.4	.759	.161	29.089
	May	22	3.0	a19.28	a56.74	b 69	a 3.95	2.47	9.21	b 54	4.19	4.51	9.9	.658	.145	29.060
	Feb.	22	3.6	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks, see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Intermittent Fever and Remittent Fever, on page 142.
b An Exception to Proposition 2, relating to Intermittent Fever and Remittent Fever, on page 142.

DIAGRAM 5 —WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1889.

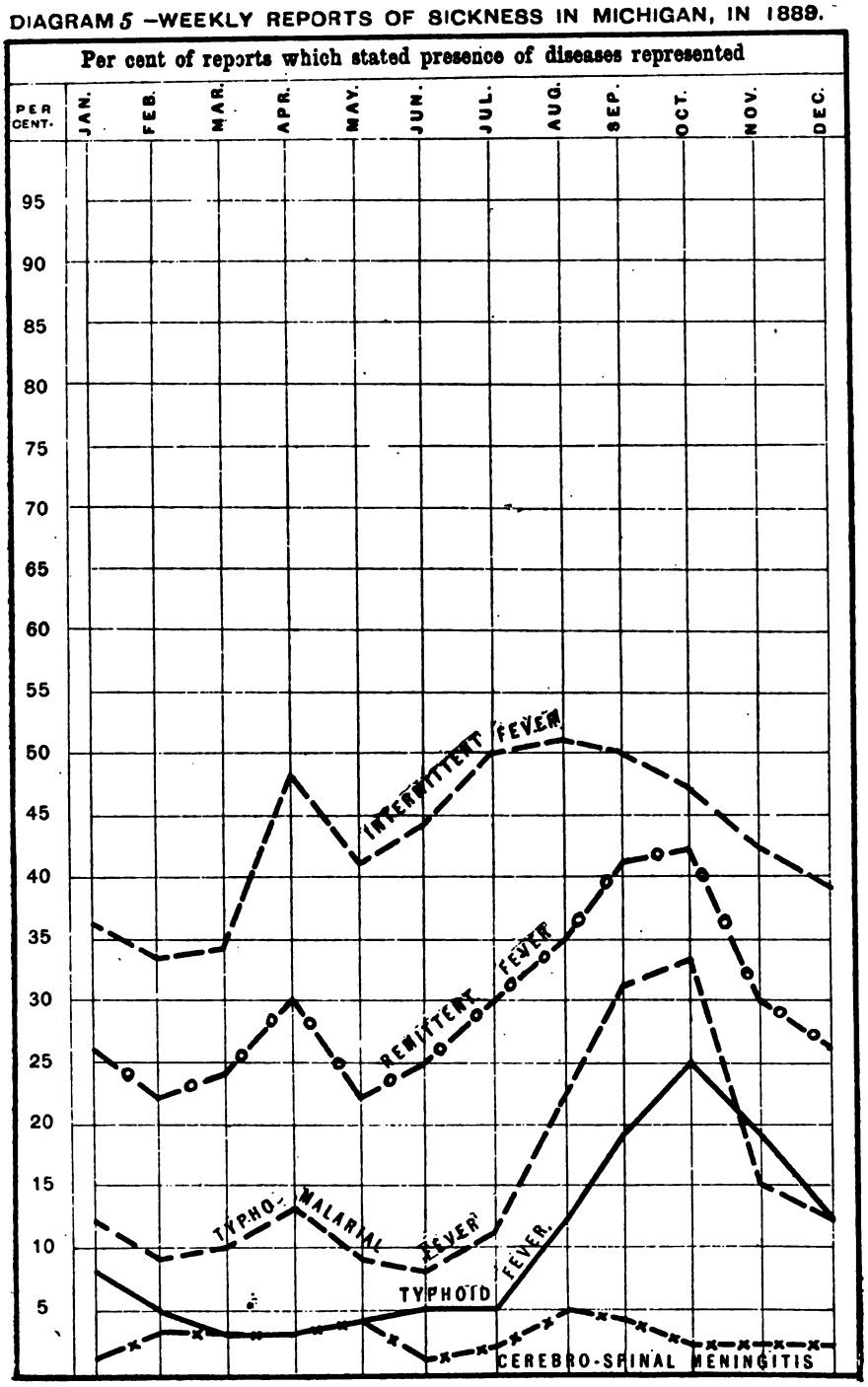


EXHIBIT XXII.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Typhoid Fever and Typho-malarial Fever, and what were the Meteorological Conditions as observed at Stations in Michigan.

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.†‡	Temperature, F. Av. Daily Range, by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours. Troy Ounces. Inhaled, ‖	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours. Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
TYPHOID FEVER.																
More than Av. Per Cent of Typhoid Fever.	Oct.	25	3.3	a16.98	a44.59	73	a 2.76	1.73	9.95	b 58	3.54	3.29	8.8	a .898	.211	29.228
	Nov.	19	3.1	a11.81	a37.95	b 84	a 2.52	1.58	10.10	b 72	3.62	3.36	b 9.7	1.118	.249	29.135
	Sept.	19	4.0	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	a .798	a .164	29.131
	Dec.	12	3.5	a13.41	a36.76	b 84	a 2.43	1.52	10.16	b 64	3.83	4.05	b 11.0	1.180	.331	29.141
	Aug.	12	4.3	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	a .520	a .115	29.192
Av.		10	3.9	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Average Per Cent of Typhoid Fever.	Jan.	8	5.5	13.93	28.18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	June	5	2.7	a18.00	a63.05	80	a 5.33	3.33	8.35	68	4.61	5.00	b 7.5	.790	.133	29.100
	July	5	3.5	a21.20	a70.69	b 75	a 6.19	3.87	7.81	b 37	b 3.80	b 3.97	b 6.9	.588	.131	29.104
	Feb.	5	6.0	17.82	18.57	88	1.24	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177
	May	4	5.2	a19.28	a56.74	b 69	a 3.95	2.47	9.21	b 54	4.19	4.51	9.9	.658	.145	29.060
	Apr.	3	6.7	a18.74	46.04	b 71	2.88	1.80	9.88	b 55	b 3.91	4.30	9.5	a1.016	a .233	29.116
	Mar.	3	7.8	16.74	35.83	b 77	2.13	1.93	9.75	b 49	b 3.95	4.15	9.4	.759	.161	29.089
TYPHO-MALARIAL FEVER.																
More than Av. Pr. Ct. of Typho-malarial Fever.	Oct.	33	3.3	a16.98	a44.59	73	a 2.76	1.73	9.95	b 58	3.54	3.29	8.8	a .898	a .211	29.228
	Sept.	31	3.5	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	a .798	.164	29.131
	Aug.	22	4.8	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	a .520	.115	29.192
Av.		16	3.9	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Average Per Cent of Typho-malarial Fever.	Nov.	15	3.7	11.81	37.95	84	2.52	1.58	10.10	72	b 3.62	b 3.36	9.7	a1.118	a .249	a 29.135
	Apr.	13	5.6	a18.74	46.04	b 71	2.88	1.80	9.88	b 55	b 3.91	4.30	9.5	a1.016	a .233	29.116
	Jan.	12	3.9	13.93	28.18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	Dec.	12	4.1	13.41	36.76	84	2.43	1.52	10.16	64	b 3.83	4.05	11.0	a1.180	a .331	a 29.141
	July	11	4.0	a21.20	a70.69	b 75	a 6.19	3.87	7.81	b 37	b 3.80	b 3.97	b 6.9	.588	.131	29.104
	Mar.	10	4.8	16.74	35.83	77	2.13	1.93	9.75	b 49	b 3.95	4.15	9.4	.759	.161	29.089
	Feb.	9	4.1	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177
	May	9	4.4	a19.28	a56.74	b 69	a 3.95	2.47	9.21	b 54	4.19	4.51	9.9	.658	.145	29.060
	June	8	3.2	a18.00	a63.05	80	a 5.33	3.33	8.35	68	4.61	5.00	b 7.5	.790	.133	29.100

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X., on page 131.
a An Exception to Proposition 1, relating to Typhoid Fever and Typho-malarial Fever, on pages 142-3.
b An Exception to Proposition 2, relating to Typhoid Fever and Typho-malarial Fever, on pages 142-3.

EXHIBIT XXIII.—MEASLES AND WHOOPING-COUGH.—*Stating for the Year and for each Month of the Year 1889, What Per Cent of the Weekly Reports of Sickness Stated Presence of Measles and Whooping-cough, and what were the Meteorological Conditions as observed at Stations in Michigan.

	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	MEASLES. Per Cent of Weekly Reports Stating Presence of.	MEASLES. Av. Order of Prevalence Where Present.†‡	Temperature, F. Av. Daily Range by Registering Thermometers.	Temperature, F. Average of Three Daily Observations.	Humidity of Air.§ Av. of 3 Daily Observations. Relative Per Cent of Saturation.	Humidity of Air.§ Av. of 3 Daily Observations. Absolute,—Grains of Vapor in a Cubic Foot of Air.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Inhaled.	Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces. Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°. Day Observation, 7 A. M. to 2 P. M.	Ozone, Relative Scale of 10°. Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Abenometer.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Monthly and for Year.	Atmospheric Pressure, Inches Reduced to 32° F. Range. Average Daily, by 3 Daily Observations.**	Atmospheric Pressure, Inches Reduced to 32° F. Average Pressure.
More than Av. Per Cent of Measles.	June	11	3.1	18.00	63.05	b 80	5.33	3.33	8.35	b 68	b 4.61	b 5.00	7.5	a.790	a .133	a 29.100
	May	10	3.5	19.28	56.74	69	3.95	2.47	9.21	54	b 4.19	b 4.51	b 9.9	a .658	a .145	a 29.060
	Dec.	9	3.7	a13.41	a36.76	b 84	a 2.43	1.52	10.16	b 64	3.83	4.05	b 11.0	1.180	a .331	29.141
	July	7	3.2	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	a.588	.131	a 29.104
	Apr.	7	4.3	18.74	a46.04	71	a 2.88	1.80	9.88	55	3.91	b 4.30	b 9.5	1.016	.233	a 29.116
	Nov.	6	3.5	a11.81	a37.95	b 84	a 2.52	1.58	10.10	b 72	3.62	3.36	b 9.7	1.118	.249	29.135
Av.		6	3.5	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Measles.	Jan.	5	3.3	13.93	28.18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	Feb.	4	3.0	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177
	Oct.	4	3.0	16.98	44.59	b 73	2.76	1.73	9.95	58	b 3.54	b 3.29	b 8.8	.898	a .211	a 29.228
	Mar.	4	5.0	16.74	35.83	77	2.13	1.93	9.75	b 49	b 3.95	4.15	9.4	.759	.161	29.089
	Sept.	3	3.4	a20.59	a61.36	b 74	a 4.82	3.01	8.67	b 42	b 3.97	b 3.70	b 9.1	.798	.164	a 29.131
	Aug.	3	3.6	a21.50	a68.58	b 70	a 5.52	3.45	8.23	b 33	b 3.93	b 4.03	b 7.7	.520	.115	a 29.192
	WHOOPING-COUGH.															
More than Av. Per ct. of Whoop.-cough.	Apr.	21	4.1	18.74	a46.04	71	a 2.88	1.80	9.88	55	3.91	b 4.30	b 9.5	1.016	.233	a 29.116
	May	19	2.5	19.28	56.74	69	3.95	2.47	9.21	54	b 4.19	b 4.51	b 9.9	a .658	a .145	a 29.060
	Mar.	19	3.7	a16.74	a35.83	77	a 2.13	1.93	9.75	49	3.95	b 4.15	b 9.4	a .759	a .161	a 28.089
	July	18	2.8	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	a .588	a .131	a 29.104
	Sept.	18	3.0	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	a .798	a .164	29.131
Av.		16	3.3	17.46	47.38	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Cent of Whooping-cough.	June	15	2.4	a18.00	a63.05	80	a 5.33	3.33	8.35	68	4.61	5.00	b 7.5	.790	.133	29.100
	Aug.	15	2.9	a21.50	a68.58	70	a 5.52	3.45	8.23	b 33	b 3.93	b 4.03	b 7.7	.520	.115	a 29.192
	Oct.	15	4.0	16.98	44.59	b 73	2.76	1.73	9.95	58	b 3.54	b 3.29	b 8.8	.898	a .211	a 29.228
	Feb.	15	4.2	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	a1.336	a .249	a 29.177
	Jan.	14	3.9	13.93	28 18	85	1.77	1.11	10.57	72	4.31	b 3.89	10.2	a1.622	a .289	29.068
	Dec.	12	3.5	13.41	36.76	84	2.43	1.52	10.16	64	b 3.83	4.05	11.0	a1.180	a .331	a 29.141
	Nov.	10	3.4	11.81	37.95	84	2.52	1.58	10.10	72	b 3.62	3.36	9.7	a1.118	a .249	a 29.135

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks, see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Measles and Whooping-cough, on page 142-3.
b An Exception to Proposition 2, relating to Measles and Whooping-cough, on page 142-3.

Cold-Weather Diseases.

EXHIBIT XXIV.—*Summary Relative to Propositions contained in Exhibits X., XII., XIV., XV., XVI., etc., (pages 131-140) concerning Relations by Months in 1889 between Greater or Less than usual Prevalence of Diseases Named, and Certain given Coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were more than Usually Prevalent in 1889.	Months (inclusive) in which Diseases named were less than Usually Prevalent in 1889.	For the 12 Months of the Year 1889. Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were more than usually Prevalent the Conditions named below were Greater than Usual, and in Months when less than Usually Prevalent these Conditions were Less than Usual.									That in Months when Diseases named were more than usually Prevalent the Conditions named below were Lower than Usual, and in Mos. when the Diseases were Less than Usually Prevalent these Conditions were higher than Usual.	
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone. Day.	Ozone. Night.	Velocity of Wind.	Atmospheric Pressure. Range. Monthly.	Atmospheric Pressure. Range. Average Daily.	Atmospheric Pressure. Average Daily.	Average Temp.	Absolute Humidity.
Bronchitis	Jan.-May, Nov.-Dec.	June-Oct.	3	8	7	7	9	12	10	9	5	10	10
Pneumonia	Jan.-May, Nov.-Dec.	June-Oct.	3	9	7	7	9	12	10	10	5	10	10
Membran. Croup	Jan., Mar., Oct.-Dec.	Feb., Apr.-Sept.	0	9	9	5	5	8	8	9	7	10	10
Diphtheria	Jan., Sept.-Dec.	Feb.-August	3	8	9	5	2	6	8	9	9	8	8
Tonsillitis	Jan.-May, Oct.-Dec.	June-Sept.	2	8	8	6	8	11	9	10	6	11	11
Influenza	Jan.-May, Oct., Dec.	June-Sept., Nov.	4	7	7	7	9	10	8	9	5	9	10
Scarlatina	Jan., Feb., Apr., May, Oct.	Mar., Jun.-Sep., Nov., Dec.	5	6	7	9	8	8	8	9	5	8	8
Rheumatism	Jan., Mar.-June, Dec.	Feb, July-Nov.	6	8	6	8	10	9	7	6	2	7	7
Neuralgia	Jan.-June, Nov., Dec.	July-Oct.	4	10	8	8	10	11	9	8	4	9	9
Consumption	Jan.-Apr., Sept.-Dec.	May-Aug.	2	8	8	4	6	9	9	10	8	11	11
Pleuritis	Jan.-May, Nov., Dec.	June-Oct.	3	9	7	7	9	12	10	9	5	10	10

* The figures in each of these 11 columns show for how many months out of the twelve months in 1889, the proposition named over the column holds true, thus, concerning bronchitis, the proposition relative to average daily range of temperature held true in only three months out of the twelve; that relative to average temperature, in ten out of twelve, etc.

Warm-Weather Diseases.

EXHIBIT XXV.—*Summary Relative to Propositions contained in Exhibits XIX., XXI., etc., (pages 144, 149, etc.), concerning Relations, by Months in 1889, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were more than Usually Prevalent in 1889.	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1889.	For the 12 Months of the Year 1889. Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Higher than Usual, and in Months when the Diseases were less Prevalent than usual These Conditions were Lower than Usual.						That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Less than Usual, and in Months when the Diseases were Less Prevalent than Usual these Conditions were Greater than Usual.				
			Av. Daily Range of Temp.	Average Temperature.	Absolute Humidity.	Atmospheric Pressure. Range. Monthly.	Atmospheric Pressure. Range. Av. Daily.	Atmospheric Pressure. Average Daily.	Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone. Day.	Ozone. Night.	Velocity of Wind.
Diarrhea	July-Oct.	Jan.-June, Nov., Dec.	8	9	9	3	4	8	11	8	8	10	11
Chol. Infantum.	July-Sept.	Jan.-June, Oct.-Dec.	9	10	10	4	3	7	9	9	7	9	10
Intermit. Fever.	Apr., June-Oct.	Jan.-Mar., May, Nov., Dec.	10	9	9	3	4	6	10	8	8	8	11
Remittent Fever	July-Nov.	Jan.-June, Dec.	7	8	8	4	5	9	9	7	9	11	10
Typhoid Fever	Aug.-Dec.	Jan.-July	5	6	6	6	5	11	6	5	9	11	8
Typho-mal. Fev.	Aug.-Oct.	Jan.-July, Nov., Dec.	7	8	8	4	6	9	9	7	7	9	10
Measles	Apr.-July, Nov., Dec.	Jan.-Mar., Aug.-Oct.	8	7	7	7	6	4	6	6	6	5	5
Whooping-cough	Mar.-May, July, Sept.	Jan., Feb., June, Aug., Oct.-Dec.	9	8	8	4	3	3	11	11	7	6	6
Av. Disease	Mar., May, July-Oct.	Jan., Feb., Apr., June, Dec.	7	8	8	2	3	7	10	9	9	9	8

* The figures in each of these 11 columns show for how many months out of the twelve months in 1889 the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to average daily range of temperature held true in eight months out of the twelve; that relative to absolute humidity nine months out of the twelve, etc.

TOTAL SICKNESS—AVERAGE DISEASE.

"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is found on page 91. Twenty-eight diseases are printed on the cards. In 1889 there were 5,000 of these card reports received. On some of the cards only one or two diseases were reported present; on others twenty or more were reported present. Had each disease (printed on this card, and only the twenty-

eight thus named) been reported present on every card received at this office, there would have been 140,000 reports of diseases present. (This is the product of 5,000 reports received multiplied by 28, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 32,612 disease reports which 32,612÷140,000 of the possible disease reports that might have been present, is 23 per cent. This 23 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." (See Diagram 4, page 141.)

Exhibit XXVI. serves to indicate the probable actual sickness in the State from the tabulated diseases in each year from 1877 to 1889. It compares the sickness in 1889 by months with the sickness by months in each of the twelve years 1877 to 1888. It also compares the sickness in 1889, by months with the sickness, by months, in each of the three years 1886–1888. This last comparison is made because of the change in the plan of reports, which occurred in May, 1885, since which time the plan has been to have reported only the sickness actually observed by the physician who reports. Previous to May, 1885, some reported sickness that, by conference with other physicians, they believed to have occurred. Since May, 1885, the subject is placed upon a scientific basis.

By Exhibit XXVI., it will be seen that the sickness reported in 1889, was, for the year, and for each month of the year, considerably less than the average reported for the twelve years 1877–88. That exhibit also shows that, for the year, and for each month of the year excepting September and October, the sickness reported in Michigan in the year 1889, was less than the average reported for the three years 1886–1888.

EXHIBIT XXVI.—SICKNESS FROM AVERAGE DISEASE.—1877-89.—*By Year and Months for each of the Thirteen Years 1877-89, Stating on an Average for such of the 28 diseases tabulated as were reported present, what Per Cent of the Weekly Reports received stated presence of the Diseases, and comparing the Average Per Cents for Months in 1889, with the Averages for corresponding Months in the Years 1877-1888; also comparing the Averages for the Months in 1889 with the Averages for corresponding Months in the three years 1886-1888.**

Years, Etc.	Annual Av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 12 years, 1877-88	29	29	28	30	29	28	26	29	31	32	30	29	28
1877	28	27	28	26	24	24	23	26	29	31	30	30	30
1878	30	30	30	31	29	28	26	28	32	35	34	30	32
1879	33	35	36	36	35	30	30	32	37	36	34	34	33
1880	32	32	32	32	31	30	31	34	36	35	32	30	31
1881	33	34	34	32	35	31	30	34	37	36	35	32	31
1882	30	31	30	30	30	29	28	28	30	34	32	31	29
1883	30	30	31	33	33	31	29	29	32	32	29	29	28
1884	29	28	29	30	28	28	29	31	34	34	33	30	29
1885	26	29	29	30	28	25	24	26	27	27	26	26	26
1886	26	26	26	28	27	26	23	26	27	28	25	25	25
1887	25	26	27	28	26	25	24	27	29	26	25	24	24
1888	24	24	26	27	26	24	23	22	25	25	23	22	23
1889 (Diagram, page 141)	23	23	22	24	23	23	21	24	27	28	26	23	22
In 1889 Less than Av. 1877-88	6	6	6	6	6	5	5	5	4	4	4	6	6
In 1889 Greater than Av. 1886-8*	....	....	....	....	....	....	....	....	=	2	2	....	....
In 1889 Less than Av. 1886-8*	2	2	4	4	3	2	2	1	=	....	....	1	2

* This last comparison is made because of the change in the plan of making the reports, which occurred in May, 1885, as explained on pages 90-91.

RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 28 diseases tabulated (in tables on pages 86-109) as were reported present, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit XXVII., below, the letter *a* marks exceptions to this proposition for the year 1889.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the twenty-eight diseases tabulated as were reported present, the relative humidity of the atmos-

phere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **greater** than the average for the year. In Exhibit XXVII., below, the letter *b* marks exceptions to this proposition for the year 1889.

What per cent of the weekly reports received in 1889 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases is graphically represented by months in Diagram 4, page 141.

EXHIBIT XXVII.—AVERAGE DISEASE.—*Stating for the Year and for each Month of the Year 1889, what Per Cent of the Weekly Reports of Sickness Stated Presence of Average Disease, and what were the MeteorologicalConditions as observed at Stations in Michigan.**

	Average Disease.			Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.		Average Per Cent of Cloudiness.	Ozone, Relative Scale of 10°.		Av. Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Av. Order of Prevalence Where Present.†‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled. ‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range. Monthly and for Year.	Range. Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Average Disease.	Sept.	28	3.5	20.59	61.36	74	4.82	3.01	8.67	42	3.97	3.70	9.1	*a* .798	*a* .164	29.131
	Aug.	27	3.4	21.50	68.58	70	5.52	3.45	8.23	33	3.93	4.03	7.7	*a* .520	*a* .115	29.192
	Oct.	26	3.3	*a*16.98	*a*44.59	73	*a* 2.76	1.73	9.95	*b* 58	3.54	3.39	8.8	*a* .898	.211	29.228
	July	24	3.1	21.20	70.69	75	6.19	3.87	7.81	37	3.80	3.97	6.9	*a* .588	*a* .131	*a* 29.104
	Mar.	24	3.5	*a*16.74	*a*35.83	77	*a* 2.13	1.98	9.75	49	3.95	*b* 4.15	*b* 9.4	*a* .759	*a* .161	*a* 29.089
	Nov.	23	3.1	*a*11.81	*a*37.95	*b* 84	*a* 2.52	1.58	10.10	*b* 72	3.62	3.36	*b* 9.7	1.118	.249	29.135
	May	23	3.2	19.28	56.74	69	3.95	2.47	9.21	54	*b* 4.19	*b* 4.51	*b* 9.9	*a* .658	*a* .145	*a* 29.060
Av.		23	3.3	17.46	47.36	77	3.47	2.17	9.51	56	3.98	4.05	9.2	.946	.201	29.128
Less than Av. Per Ct. of Av. Disease.	Jan.	23	3.3	13.93	28.18	85	1.77	1.11	10.57	72	4.31	*b* 3.89	10.2	*a*1.622	*a* .289	29.068
	Apr.	23	3.6	*a*18.74	46.04	*b* 71	2.88	1.80	9.88	*b* 55	*b* 3.91	4.30	9.5	*a*1.016	*a* .233	29.116
	Dec.	22	3.2	13.41	36.76	84	2.43	1.52	10.16	64	*b* 3.83	4.05	11.0	*a*1.180	*a* .331	*a* 29.141
	Feb.	22	3.4	17.32	18.57	88	1.34	.84	10.84	70	4.15	4.29	10.7	*a*1.336	*a* .249	*a* 29.177
	June	21	2.9	*a*18.00	*a*63.05	80	*a* 5.33	3.33	8.35	68	4.61	5.00	*b* 7.5	.790	.133	29.100

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks, see Exhibit X., page 131.
a An Exception to Proposition 1, relating to Average Disease, on page 153.
b An Exception to Proposition 2, relating to Average Disease, on page 153.

Exhibit XXVII., continued for a series of years, should show what meteorological conditions are on the whole most conducive to health in Michigan, and what are most to be guarded against by residents of Michigan.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1889.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues a subject treated, for the preceding year, on pages 197–278 of the Report of the State Board of Health for the year 1889, and for former years in preceding Reports of this Board.

Whenever information is received at this office of the outbreak (in any locality in Michigan) of diphtheria, scarlet fever, typhoid fever, small-pox, measles, whooping-cough, or glanders, a letter is sent to the health officer of the township, city or village in which the disease is present (if the name of the health officer has been reported to this office; if not, to the president of the Board of Health), calling his attention (if the report was not received from him) to the existence of the disease within his territory, indicating his duties and powers, and the proper measures to be taken, in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it,* asking for a report of the methods employed for the restriction of the disease, and the results of efforts to suppress it—and the number of cases and deaths in each outbreak. Except in the case of typhoid fever, for which a special form of letter was employed, the form of the letter generally sent during the year 1889 was substantially the same as that printed on pages 251–252 of the Report of the State Board of Health for the year 1884. With this letter was sent a blank form (L) for notice of the first case of a dangerous communicable disease, blank forms (M) for weekly reports during the continuance of the disease, and a blank form (K) for special final report. The (L) and (M) now in use are substantially the same as those printed on pages 253–254 of the Report for 1884. The blank (K), for final report, is printed on pages xiii.–xiv. of the Report of this Board for 1888.

The large number of replies received to communications in regard to contagious diseases, the general desire manifested by health officers for documents on the restriction of those diseases, and the general care taken to send complete reports to this office, show an increasing interest in sanitary measures among the people, and a commendable effort on the part of the local health authorities to have every means employed to prevent the spread of communicable diseases.

* It is believed that these documents, distributed in this manner, are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus lead to co-operate with the local health officials in efforts to stamp out disease. Some evidence of the value of this work may be seen further on in this article.

TABLE 1.—*Number of Places in Michigan at which Communicable Diseases were Reported Present During Each Week in 1889.*

Weeks ending:		Diphtheria.	Scarlet Fever.	Typhoid Fever.	Measles.	Small-pox.
January	5	23	33	14	5	5
	12	17	40	22	5	7
	19	21	40	13	2	9
	26	25	42	12	8	7
February	2	19	36	11	7	7
	9	13	29	7	6	6
	16	16	29	10	5	9
	23	15	22	6	3	10
March	2	14	25	8	4	8
	9	12	18	7	6	5
	16	12	18	8	5	4
	23	15	15	5	7	2
	30	10	12	2	7	2
April	6	10	20	4	3	0
	13	14	23	3	5	1
	20	5	12	4	6	1
	27	6	20	2	6	1
May	4	8	22	5	4	0
	11	8	17	5	4	0
	18	7	22	2	11	0
	25	5	13	2	9	2
June	1	11	13	4	6	2
	8	8	15	12	5	1
	15	10	20	5	10	0
	22	12	19	5	6	0
	29	10	11	5	7	0
July	6	8	15	3	3	0
	13	7	9	4	6	0
	20	15	9	6	3	0
	27	17	14	9	5	0
August	3	8	10	5	2	0
	10	12	9	14	5	0
	17	8	6	14	3	0
	24	7	8	11	3	0
	31	13	5	20	1	0
September	7	19	10	22	2	0
	14	16	9	21	3	0
	21	12	8	22	4	0
	28	18	11	31	3	0
October	5	17	14	36	5	0
	12	21	25	50	4	0
	19	23	27	40	5	0
	26	27	27	54	5	0
November	2	40	22	54	5	0
	9	33	31	39	7	0
	16	38	33	49	9	0
	23	38	35	52	10	1
	30	32	35	30	8	2
December	7	25	34	30	10	2
	14	24	25	25	10	2
	21	29	25	21	8	1
	28	30	18	19	11	1
Average per week		16.60	20.38	16.62	5.62	1.88

DIPHTHERIA IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1889.

DISTRIBUTION.

During the year ending December 31, 1889, there were reported to the office of the State Board of Health 398 outbreaks of diphtheria, in 329 localities in Michigan, which resulted in 3,157 cases and 683 deaths. Of these, 608 cases and 158 deaths occurred in the city of Detroit, and 275 cases and 63 deaths in the city of Grand Rapids; leaving 2,274 cases and 462 deaths as having occurred in the State outside of those two cities.

From this it may be seen that 28 per cent of all cases and 32 per cent of all deaths reported as having occurred in the State during the year 1889, occurred in these two cities. The percentage of cases which were reported to have proved fatal, was as follows: For the whole State, 22 per cent; for Detroit and Grand Rapids, combined, 25 per cent; and for the State, exclusive of Detroit and Grand Rapids, 20 per cent. This statement would seem to indicate that the mortality from diphtheria in the two large centers of population, Detroit and Grand Rapids, was proportionately greater than that of the smaller towns and rural districts of the State. This apparent excess of mortality, may, however, be due to mild cases of the disease not having been reported from those cities.

On page 158 is a map of the State of Michigan, which exhibits, for each county, the number of localities where diphtheria was reported to have occurred during the year 1889; also the numbers of outbreaks, cases, and deaths which were reported as having occurred in those localities. This map shows that from six counties—Wayne, Muskegon, Kent, Marquette, Menominee and Saginaw, whose aggregate population does not exceed 25 per cent of the whole population of the State, there were reported 53 per cent of all cases and 33 per cent of all deaths which occurred in the State during the year; and that from 14 counties—Isle Royal, Baraga, Iron, Manitou, Presque Isle, Montmorency, Alpena, Oscoda, Missaukee, Roscommon, Ogemaw, Clare, Gladwin and Midland, containing a joint, estimated, population of 59,228, there was no case of diphtheria reported during the year.

The following table—exhibiting the estimated population, the number of reported cases of diphtheria, and the number of reported cases per 10,000 of estimated population, for each tier of counties in the State, further illustrates the distribution of diphtheria throughout the State during the year.

From this table it may be seen that, for the whole State, the number of reported cases per 10,000 of estimated population was 15.4; that in five of the six most northern tiers of counties (calling the Upper Peninsula one), the number of reported cases per 10,000 population was less, and in only one it was greater, than the average for the State; whereas from three of the six most southern tiers of counties the number of reported cases per 10,000 population was greater, and from the other three less than the average for the State.

It is a noticeable fact, that although no diphtheria was reported from several counties in the Upper Peninsula, the proportionate number of cases to population in that tier, far exceeds that for the whole State, and is greater than that for any other tier of counties. This fact may be due to climatic influences.

DISTRIBUTION OF DIPHTHERIA IN MICHIGAN IN 1889.



TABLE 2.—*Exhibiting the Estimated Population of Michigan for the year 1889, by tiers of counties (Upper Peninsula as one tier); also the number of cases of Diphtheria* REPORTED *from each of these divisions for 1889, and the number of cases per 10,000 estimated population of each division.*

Counties in Groups, most Northern ones First.					Estimated Population, 1889.*	Reported Cases of Diphtheria, 1889.	Average Reported Cases per 10,000 of Estimated Population
State					2,048,109	3,157	15.4
Upper Peninsula	Alger.	Mackinac.	Houghton.	Marquette.	171,106	385	22.5
	Delta.	Chippewa.	Ontonagon.	Iron.			
	Schoolcraft.	Isle Royal.	Gogebic.	Menominee.			
	Luce.	Keweenaw.	Baraga.				
Eleventh tier of counties	Manitou.	Cheboygan.			34,650	31	8.9
	Emmet.	Presque Isle.					
	Charlevoix.						
Tenth tier of counties	Leelanaw.				37,953	10	2.6
	Antrim.	Alpena.					
	Otsego.						
	Montmorency.						
Ninth tier of counties	Benzie.	Crawford.			32,577	19	5.8
	G'd Traverse.	Oscoda.					
	Kalkaska.	Alcona.					
Eighth tier of counties	Manistee.				60,171	41	6.8
	Wexford.	Ogemaw.					
	Missaukee.	Iosco.					
	Roscommon.						
Seventh tier of counties	Mason.	Gladwin.			134,689	83	6.2
	Lake.	Bay.					
	Osceola.	Huron.					
	Clare.	Arenac.					
Sixth tier of counties	Oceana.				82,722	94	11.4
	Newaygo.	Midland.					
	Mecosta.						
	Isabella.						
Fifth tier of counties	Muskegon.				243,104	527	21.7
	Montcalm.	Tuscola.					
	Gratiot.	Sanilac.					
	Saginaw.						
Fourth tier of counties	Ottawa.	Shiawassee.			351,757	664	18.9
	Kent.	Genesee.					
	Ionia.	Lapeer.					
	Clinton.	St. Clair.					
Third tier of counties	Allegan.	Livingston.			226,123	246	10.9
	Barry.	Oakland.					
	Eaton.	Macomb.					
	Ingham.						
Second tier of counties†	Van Buren.				447,295	919	20.5
	Kalamazoo.	Washtenaw.					
	Calhoun.	Wayne.					
	Jackson.						
First tier of counties	Berrien.	Hillsdale.			225,962	138	6.1
	Cass.	Lenawee.					
	St. Joseph.	Monroe.					
	Branch.						

* Estimated, by tiers of counties, from the U. S. censuses of 1880 and 1890, on the basis that the increase or decrease shown by those censuses was uniform during the intervening ten years.

† Deducting the estimated population of Detroit (196,922) and the number of cases (608) reported from that city, the ratio of cases to population in this tier of counties, is 12.4 cases per 10,000 population.

In the city of Detroit, the ratio of reported cases to estimated population is 30.9 cases per 10,000 population.

The data given in Table 4, on page 161 of this article, show that diphtheria is most prevalent during the winter months, that it is essentially a "cold-weather" disease. This being the case, we might expect to find a greater number of cases of this disease in the Upper Peninsula, where the winters are more protracted, than in more southern portions of the State where the cold-weather seasons are of shorter duration.

DIPHTHERIA IN 1889, COMPARED WITH PREVIOUS YEARS.

Comparisons with previous years, to ascertain the comparative increase or decrease of prevalence of this disease in the State, would no doubt be interesting and instructive if there existed a fixed basis on which to found such comparisons; but from year to year there has been a steady improvement, both in the methods adopted by the State Board of Health in securing and compiling reports; and in the efforts made by local health authorities throughout the State to furnish in their reports the information desired by the State Board. It is therefore impossible to determine the increase or decrease of prevalence of the disease in the State by comparison of the numbers of outbreaks of the disease, and the cases and deaths resulting therefrom, reported to this office year by year; and this fact should be borne in mind in referring to the following table:

TABLE 3.—DIPHTHERIA IN MICHIGAN: *Numbers of Reported Outbreaks, Localities (in which they Occurred), Reported Cases and Deaths, Average Numbers of Cases and Deaths per Outbreak, and the Per Cent of Cases which proved fatal, as reported for each of the Eight Years, 1882-9; also Averages of the same for the Five Years, 1884-8, and Comparisons of the Facts for 1889 with those for 1888, and with the Averages for the Five Years, 1884-8.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Average Cases per Outbreak.	Reported Deaths.	Average Deaths per Outbreak.	Per Cent of Cases which proved fatal.
1882	.....	163	2,046	.....	495	.....	24.
1883*	.....	125	2,246	.....	543	.....	24.
1884†	362	302	3,915	10.8	905	2.5	23.
1885	467	396	4,018	8.6	964	2.	24.
1886	550	422	4,244	7.7	982	1.8	23.
1887	466	371	3,382	7.3	825	1.8	24.4
1888	337	283	2,228	6.6	532	1.6	23.9
1889	398	329	3,157	7.9	683	1.7	21.6
Average for five years, 1884-1888	436	355	3,557	8.2	842	1.9	23.7
Variations in 1889 from 1888	+61	+46	+929	+1.8	−151	−0.1	−2.3
Variations in 1889 from the average for five years, 1884-8	−38	−26	−400	−0.3	−159	−0.2	−2.1

* The use of the blank form "M" for weekly reports was begun in May, 1883.
† The use of the annual reports of health officers in compiling diphtheria was begun in 1884.

The above table would seem to indicate that the prevalence of diphtheria in the State during 1889, although less than the average for the five years 1884–8, was greater than in the year 1888. This apparent increase in prevalence of the disease may, however, not be real, but due to the causes before mentioned, namely: improved methods of collecting and compiling information at this office, and increased assiduity on the part of local health officials in reporting all outbreaks of the disease which came to their knowledge. It may be remarked that although the numbers of cases and deaths per outbreak in 1889 were slightly higher than in 1888, the ratio of deaths to cases in 1889 was less than in 1888, or any other year included in the above table.

OUTBREAKS OF DIPHTHERIA BY MONTHS IN 1889.

TABLE 4.—*Exhibiting the number of Outbreaks of Diphtheria beginning and the number ending in each month during the year 1889. (The total number of outbreaks here given is 352, that being all in which the dates of the first and last cases were definitely reported).*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began	42	17	29	17	20	15	15	17	25	47	51	57
Ended	45	22	33	20	15	15	12	17	21	38	38	76

REPORTED SOURCE OF CONTAGION OF DIPHTHERIA.

The following table shows the various sources of the contagium which was believed, by local health officers, to have caused the 398 outbreaks of diphtheria reported to the Office of the State Board of Health as having occurred in the State during the year 1889.

Reported Sources of Diphtheria in 1889.	Number of Outbreaks.
Traced to a former case	75
Probably traced to a former case	28
Unsanitary conditions	41
Bad water	11
Unknown (includes 7 outbreaks reported "sporadic," 1 "swimming," 1 "open winter" and 1 "getting wet")	143
"Hard cold"	2
Not reported	98
All outbreaks	398

DIPHTHERIA TRACED TO A FORMER CASE.

The above table shows that in 75 instances, local health officers reported having traced the source of contagion to a former case of the disease; and following are given a few extracts from reports of those health officers who so reported.

"A cousin of the patient who had a sore throat some two weeks previously visited and slept with the patient" * * * .—*C. W. Huff, health officer, Pine Grove township, Van Buren county.*

"At school in Ovid township."—*Chas. B. Giffles, health officer, Victor township, Clinton county.*

"Brought from Traverse City".—*H. W. Willard, M. D., health officer, South Arm township, Charlevoix county.*

"Patient, who was a servant girl at a house at Bad Axe where it was reported a child had croup, left on account of a sore throat and came to Port Austin where her parents lived. This proved to be a case of diphtheria".—*B. Richards, M. D., health officer, Port Austin village, Huron county.*

"Case was contracted in the village of Red Jacket, where the patient was employed as a nurse-maid." * * * *A. I. Lawbaugh, M. D., health officer, Osceola township, Houghton county.*

"Going into a house in Mason, Mich., to visit a sister who was sick with diphtheria and no danger signal up".—*C. L. Randall, M. D., health officer, Ingham township, Ingham county.*

"Supposed to have been brought from Jackson by a lady who came visiting and had sore throat while here".—*A. W. Saxton, M. D., health officer, Henrietta township, Jackson county.*

"Nos. 1, 2 and 3, direct contagium (from family of Jas. Johnson, of Rich township, Lapeer county). * * * No. 4, carried by father who frequently visited Jas. Johnson's premises in Rich, Lapeer county, then suffering from fatal form of the disease" * * * .—*E. Conley, M. D., health officer, Watertown township, Tuscola county.*

"Patient was in Ohio taking care of relatives sick with the disease, came home and soon was taken with diphtheria".—*M. A. Jerome, M. D., health officer, Fairfield township, Lenawee county.*

"Was brought here by a woman who resided at Gould City, Mackinac county, Mich., where she had been exposed".—*Frank J. Brecker, health officer, Brevort township, Mackinac county.*

"The child which I have reported as having diphtheria was taken sick on the 28th of June at the residence of Mr. Harry Loop, grandfather of the child. He lives in the townsbip of Ferry, five miles from here. * * * I understand from Doctor Wilson that a number of cases of diphtheria have been contracted at different times in this same house in the township of Ferry. It would seem quite important that the matter be investigated and the cause determined, if possible".—*W. L. Griffin, M. D., health officer, Shelby township, Oceana county.*

"The first case was a Danish immigrant, who stated that a man died on ship-board just before entering port, from a very sore throat".—*N. E. Bachman, M. D., health officer, city of Stanton.*

"Think the disease was contracted by articles of clothing formerly belonging to a person who died from this disease in Indiana, said clothing being sent to friends in this neighborhood".—*Geo. W. Fry, health officer, township of Brooks, Newaygo county.*

"They had the diphtheria in the town of Eckford, and the lady went and sat up with one sick and then with corpse, and one week after she was taken sick with the diphtheria".—*Joseph E. Daniels, health officer, Clarendon township, Calhoun county.*

TABLE 5.—*Exhibiting the Localities from which Diphtheria was Spread (according to the Official Reports), with the Number of Cases and Deaths, if Reported; the Secondary Localities into which the Disease was said to have been Introduced from the First (with Number of Cases and Deaths). Compiled from Reports by Health Officers who were able to Trace the Source of Contagium to other Localities.*

First Localities from which Diphtheria Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Allegan county:					
Trowbridge township	2	0	Van Buren county:		
			Pine Grove township	1	0
Barry county:					
Carlton township	7	0	Ionia county:		
			Campbell township	12	1
Calhoun county:					
Battle Creek city	28	0	Calhoun county:		
			Pennfield township	4	2
Chippewa county:					
White Pine river	*		Chippewa county:		
			Sault Ste. Marie city	5	2
Clinton county:					
Ovid township	*		Clinton county:		
			Victor township	3	3
Eaton county:					
Charlotte city	1	0	Eaton county:		
			Hamlin township	1	0
Grand Traverse county:					
Traverse City village	*		Charlevoix county:		
			South Arm township	3	1
Huron county:					
Bad Axe	*		Huron county:		
			Port Austin village	2	0
Houghton county:					
Red Jacket village	6	0	Houghton county:		
			Osceola township	4	2
Ingham county:					
Mason city	6	0	Ingham county:		
			Ingham township	1	0
Ingham county:					
Webberville village	20	2	Livingston county:		
			Conway township	5	0
Jackson county:					
Jackson city	*		Jackson county:		
			Henrietta township	5	1
			Summit township	9	1
Kent county:			Genesee county:		
Grand Rapids city	275	63	Gaines township	12	4
			Kent county:		
			Browne township	1	0
			Grand Rapids township	99	20
			Manistee county:		
			Manistee township	4	2
Lake county:					
Deer Lake	*		Marquette county:		
			Ishpeming city	29	7
Lapeer county:					
Rich township	32	6	Tuscola county:		
			Watertown township	10	2
Lenawee county:					
Adrian city	3	0	Lenawee county:		
			Rome township	1	0
Livingston county	4		Ingham county:		
			Webberville village	20	2
Mackinac county:					
Gould city	*		Mackinac county:		
			Brevort township	4	1
Manistee county:					
East Lake	*		Oakland county:		
			Bloomfield township	1	0
Marquette county:					
Ishpeming city	29	7	Menominee county:		
			Iron Mountain city	100	22
Marquette county:					
Marquette city	*		Houghton county:		
			Red Jacket village	6	0
Mason county:					
Ludington city	1	1	Manistee county:		
			Stronach township	2	1

*This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

TABLE 5.—CONTINUED.

First Localities from which Diphtheria Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Mecosta county:					
Big Rapids city	1	0	Mecosta county:		
			Green township	20	1
Montcalm county:					
Douglas township	1	0	Montcalm county:		
			Day township	1	0
Muskegon county:					
Muskegon city	161	34	Muskegon county:		
			Ravenna township	2	1
Oceana county:					
Ferry township	*		Oceana county:		
			Shelby village	1	0
Ottawa county:					
Holland city	85	11	Allegan county:		
			Saugatuck township	2	0
Saginaw county:			Saginaw county:		
East Saginaw city	11	3	Buena Vista township	5	1
			Saginaw city	154	21
			Spaulding township	2	0
			Zilwaukee township	1	0
Tuscola county:			Tuscola county:		
Fremont township	*		Dayton township	2	0
Gilford township	8	3	Fair Grove township	1	0
Mayville village	2	1	Fair Grove township	2	0
Tuscola township	7	0	Lapeer county:		
			Marathon township	8	0
Washtenaw county:					
Ann Arbor city	2	0	Washtenaw county:		
			Pittsfield township	3	0
			St. Clair county:		
			St. Clair city	2	1
			Washtenaw county:		
Wayne county:			Ypsilanti city	3	0
Detroit city	608	158	Wayne county:		
			Dearborn township	10	3
			Springwells township	6	1
			Monroe county:		
			Monroe city	2	0
Wexford county:					
Sherman village	*		Wexford county:		
			Boon township	1	1
"Outside city"	*		Gogebic county:		
			Bessemer city	1	0
"Neighboring village"	*		Isabella county:		
(OUTSIDE THE STATE.)			Fremont township	3	0
Michigan City, Indiana			Berrien county:		
			New Buffalo township	16	3
Jonesville, Wisconsin			Houghton county:		
			Houghton township	2	1
"Clothing brought from Indiana"			Newaygo county:		
			Brooks township	19	3
Ontario, Canada			Sanilac county:		
			Washington township	3	0
Kentucky			St. Joseph county:		
			Sturgis village	2	2
Ohio			Lenawee county:		
			Fairfield township	1	0
Green Bay, Wisconsin			Menominee county:		
			Spalding township	4	2
Toledo			Monroe county:		
			Monroe city	2	0
"Contracted on shipboard"			Montcalm county:		
			Sidney township	3	0

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

In the following two instances the contagium was reported to have been carried to a third locality:—

From Livingston county to Webberville village, Ingham county; thence to Conway township, Livingston county; and from Deer Lake, Lake county, to Ishpeming city, Marquette county; thence to Iron Mountain city, Menominee county.

From the data contained in the foregoing table the following facts are deducible:—

1. That there occurred in the State, during the year 1889, 37 "first-locality outbreaks" of diphtheria, from which 48 other localities were infected with the disease.

2. That in the 48 localities thus infected, 576 cases and 104 deaths are reported to have occurred.

3. That 15, or 41 per cent, of the "first-locality" outbreaks mentioned, (from which 86 cases and 21 deaths were reported to have occurred) were not reported to this Office as required by law.

4. That there occurred 9 outbreaks of the disease, resulting in 52 cases and 11 deaths, the causal contagium of which was brought from "first-localities" outside this State.

Examination of the reports made in regard to the 22 "first-locality" outbreaks, which *were* reported to this office, shows that in only two instances the preventive and restrictive measures prescribed by the State Board of Health, were fully carried out. It is therefore reasonable to assume that nearly all of the 576 cases and 104 deaths which are reported to have occurred in the 48 "secondary-locality" outbreaks, may be attributed to neglect by health officers, or other persons, who should have controlled the "first-locality" outbreaks from which the contagium spread.

Diphtheria outbreaks probably traced to a former case.

Below are given a few extracts from reports of health officers who probably traced the contagium to a former case.

"This last case originated from the house where people, who lived and moved out, were affected, as near as I can find out, with diphtheria, but did not report it, consequently the house was not disinfected when new family moved in".—*L. A. Warsabo, M. D., health officer, city of Coldwater, Brunch county.*

"They think the doctor brought it. He was doctoring a patient at his house when he was doctoring cases of diphtheria in the other Town".—*Joseph E. Daniels, health officer, Clarendon township, Calhoun county.*

"Cause, I think, is a child died in the same house a few years ago".—*J. A. Carlstein, M. D., health officer, Charlevoix village, Charlevoix county.*

"Source of contagium in first case probably, case of 'membranous croup' in same house ending fatally, a year ago".—*F. E. Fletcher, M. D., health officer, Torch Lake township, Houghton county.*

"This outbreak is supposed to have been brought from Webberville".—*L. R. Houghton, M. D., health officer, Rolland township, Isabella county.*

"Contagium brought from Jackson as near as I can learn".—*H. J. Hale, M. D., health officer, Grass Lake township, Jackson county.*

"No source of contagium could be found, unless it was from two colts which had 'distemper,' both of them broke under throat, one of them died. The boy who first had diphtheria took care of these colts, and the father said 'the boy's breath smelled just like the colts'" * * * .—*Wm. E. Allen, M. D., health officer, Byron township, Kent county.*

"The case existing was caused from, first, about three years ago the family lost three children from diphtheria in the same house. They took some of the clothes worn by at least one of the children who died and packed them away in a trunk without even washing, and kept them there until two weeks ago when they unpacked them and the patient now sick commenced wearing a dress that was worn by one of deceased" * * * .—*J. S. Clark, M. D., health officer, Chippewa township, Mecosta county.*

"Supposed to be contracted from articles bought of a family who had the disease last year".—*W. A. Burnham, M. D., health officer, Rockland township, Ontonagon county.*

Diphtheria attributed to unsanitary conditions.

The following extracts are taken from the reports of health officers who attribute the outbreaks of diphtheria to unsanitary conditions:

"Supposed to be bad sanitary conditions". "Pure nastiness". "In my judgment cases 2, 3, 4 and 5 were developed after drinking water from a condemned well, the water of which was contaminated by proximity to an old vault". "Filth, impure air, bad ventilation". "Physician says source was sporadic, from bad sanitary condition of house and habits of family". "Impure water and filthy condition of back yard". "Slops thrown by the door". "Filth around the house". "Unsanitary conditions". "Defective drainage". "Impure atmosphere due to bad sewerage". "Filthy privy and premises generally".

DIFFERENCES IN DIAGNOSIS.

Experience seems to indicate that in the adult person, diphtheria is not, as a rule, characterized by the presence of the false membrane; and that, if present, the patches are likely to be small and not to continue visible for any considerable length of time. Irrespective of age, "benignant cases" of the disease may occur, where there is catarrhal manifestation; but no formation of membrane. Still others where a membrane forms on organs other than those of the throat, and thus escapes detection. The true diphtheritic nature of these mild forms of the disease being frequently unrecognized, the disease is not treated as anything serious, a physician is not called, or when one is called, the mild form of the disease awakens doubt as to its true nature. From just such mild cases, contagium may be imparted, especially to children, which may develop diphtheria in its most malignant form; therefore, whenever there is any question as to the diphtheritic nature of the disease, the patient should be isolated, and disinfection resorted to, with as much care and thoroughness as in undoubted cases of diphtheria.

The above-mentioned mild forms of diphtheria seem to be a prolific cause of the spread of the disease in Michigan. The following extracts from reports of local health officials, received at the office of the Secretary of the State Board of Health, give eleven instances where outbreaks of the disease have been attributed to just such mild cases:—

1.—"Case mild. * * * Diphtheria in this form is endemic here. There will be a number of sporadic cases having no connection, and suddenly it will break out from the contagion of one of these mild cases and infect a whole neighborhood".

2.—"The outbreak of diphtheria in G—— seems to have been brought about thus: K——'s daughter came home from J———, having what physician called tonsillitis. In less than a week K———'s youngest son had, as they thought, tonsillitis. F———'s son called at K———'s. In about a week had (in school) sore throat, went home, called Dr. H——, it was diphtheria and the boy, 15 years old, died. Three others in F——'s family took it in less than a week after exposure. K——s did *not* go to *school* but three others of their family had most emphatically *diphtheria* and doubtless the youngest son as well as the daughter from J—— had the same, less severe, and mistaken for tonsillitis.

"P——'s daughter was in school when F—— was taken and she was kept out immediately, as a safeguard, by her parents. In just one week she had *diphtheria*, and in *three days* after she showed the disease, her infant brother 15 months old was taken and died—in three days. It was a bad case and genuine.

Summary:—"K——s, exposed to *tonsillitis*, do not go to school, and have *diphtheria*. F——, exposed at K——'s, has diphtheria *in school*. P——'s girl, exposed in school and stays home, has diphtheria in just one week, and the baby in three days (unless she carried infection in her clothes). * * *

"Another family named W—— had at least one case of diphtheria from the school exposure, as I understand."

3.—"In answer to your inquiry will say, as far as I know, every case of diphtheritic croup that occurred in this township during 1889, proved fatal. The first case was O.'s child, shortly after J. C. J's. Mrs. O. had been doing Mrs. J.'s washing. S., another case, lived on O.'s farm. S. is brother to Mrs. O. He lost one. Rev. C. J. was supervisor and he preached the funeral sermon of C. J., the first fatal case of the kind in the J. family, to a full house, and stated during his remarks that there was nothing to fear from the sickness as there was nothing contagious about the disease at all. The doctors did not talk as though there was any particular liability of any taking the disease by contact. * * *. I omitted to say that Mr. J. had two other physicians when I got there, both of whom said it was not necessary to placard the premises, or take other precautionary measures."

In the foregoing instance there occurred 12 cases of diphtheria, all of which were reported to have proved fatal.

4.—"It seems almost impossible for me to give you a satisfactory report of cases of diphtheria in our township. There were a number of cases of tonsillitis in the town and no one paid any attention to it, and of course it was not reported; but some of them were quite sick. I think that there were no less than twelve or more cases in this neighborhood. We had four in our own family. One of our boys was attending school in Marshall, was taken there and was very sick. * * * Daniel Earl's was the first one reported as having diphtheria. As there had been so many cases of tonsillitis around it was not thought to be any different. The next was Samuel Thunder's, where eight were sick and one died. Duke Howe's family was next, three died out of six. We do not know how they took the disease."

5.—"You are hereby advised that there have occurred ten (10) cases of diphtheria in this city since June 18, 1889. Six have recovered and four died. These four died during the last five days. The first cases seemed very mild, so we did not take the extraordinary precautions of police guard as we did with such signal success early this year."

6.—"Supposed to have been brought from Jackson by a lady who came visiting and had sore throat while here."

7.—"In regard to diphtheria in Rich township last year, which began Sept, 1889, and ended Jan., 1890, in my report I made a statement that children came to school with sore throats and other children took diphtheria from them and several died. The exact source of contagium I believe was at John B. McIntyre's, whose children came to school with sore throats, although none of them were bad, Dr. Curtis, of Mayville and Dr. Seeley of Mayville were employed to go and examine and make report. They pronounced it diphtheria in a slight form."

8.—"I am compelled to report the presence of diphtheria again in this township. * * * There has been considerable throat trouble in this section this winter and this may have some connection with the cases reported, and more or less developed by the condition of the patient."

9.—"A cousin of the patient who had a sore throat some two weeks previously visited and slept with the patient. Mother said the child had had sore throat and there were white spots on the tonsils, but Dr. —— said it was ulcerated sore throat."

10.—"The disease occurred in the family of Thomas McCulloch, a farmer who had a family of eight children, aged from eighteen to four years. The younger three died. The physician in charge * * * called the disease membranous croup, said it was not contagious. The whole family had the disease, including the parents."

11.—"Diphtheria broke out in a district where they were having protracted meeting. All cases of diphtheria were quarantined. Though a good deal of sore throat and tonsillitis ran around, no physician being called. This diphtheria seems to be the tail end of '*this tonsillitis going around*,' as the mother said."

The extracts above cited, and many more similar ones which might be given, seem to furnish undoubted evidence in support of the two propositions previously advanced, namely: (1) That from mild cases of diphtheria the most malignant types of the disease, ending fatally, may develop, and, (2) That neglect of such cases and errors in diagnosing them, have proved to be prolific cause of the spread of the disease in Michigan during the past year.

The foregoing facts seem to strongly emphasize the recommendations of the State Board of Health, that all cases of sore throat be looked upon

with suspicion, carefully watched, and where there is doubt as to their nature, the public be given the benefit of the doubt by the adoption of all the precautionary measures prescribed for veritable, well-defined cases of diphtheria; and in this connection, it may be well to again call attention to the following resolutions, adopted by this Board:—

RESOLUTIONS ADOPTED BY THE MICHIGAN STATE BOARD OF HEALTH, JAN. 10, 1888.

WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple tonsillitis, pharyngitis, or laryngitis, and

WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

Resolved, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities in their efforts to restrict such diseases, in every case, to give to the public safety the benefit of the doubt, and in localities where diphtheria exists to regard cases of acute sore throat as suspected cases of diphtheria;

Resolved, That suspected cases of dangerous diseases should be reported, and precautionary measures should be taken.

February 7, 1889, the following preamble and resolution were unanimously adopted:—

WHEREAS, It is often impossible to discriminate between cases of diphtheria and membranous or inflammatory croup; and

WHEREAS, Modern researches point to a probable common origin of these diseases,

Resolved, That in the opinion ot this Board, membranous or inflammatory croup should be classed with diseases communicable and dangerous to the public health, and should be reported as such, and the same precautions should be taken in cases of this disease, as regards isolation and disinfection, as in cases recognized as diphtheria.

Bearing on the subject of difference in diagnosis, Dr. John C. Rollmann, of Burr Oak, in a communication to the State Board of Health, recommends a change in the law by which the opinion of several physicians may be called by the local board of health in cases of disagreement in diagnosis. He writes:—

"Since professional men in all lines have time for such 'first chances,' it would hardly impose on them much as voluntary guardians of physical well-being to compel them in case of controversy to see any such patient, and on a blank furnished by the local board of health, state the symptoms and the disease, and return the same to the board of health for file. Of course some reasonable compensation ought to be granted, and never should any partnership or consultation be permitted, that is as far as the making out of the report is concernod. The result would be more guarded diagnosis, greater confidence of the public in regard to expressed medical opinion, and avoidance of vituperation from meddling with others' patients, from true and untrue allegations."

MEASURES TAKEN TO RESTRICT DIPHTHERIA, AND THE RESULTS.

The following are a few extracts from the reports of health officers relative to measures taken to restrict diphtheria:—

F. R. Zimmerman, M. D., health officer of the city of Hastings, Barry county, writes, in regard to a child who had diphtheria:

"The child was kept in a room that was well heated and ventilated, and retained in that room during the sickness."

Only one case occurred in the above outbreak.

Dr. E. Fairbanks, health officer of Ellsworth township, Lake county, writes:

"The case here reported was not reported to me until late last night. The folks had not sought medical advice until yesterday the 17th, as they thought it a case of tonsillitis only. I went there today and had house thoroughly fumigated and child removed to small house near by and only attendant allowed in."

Two cases occurred in the above-mentioned outbreak, in the same family, but the disease was confined to the one house.

Dr. R. J. Smith, Au Gres township, Arenac county, describes the manner of restricting an outbreak of diphtheria, as follows:—

"The house was placed under quarantine by posting notice. On first suspicion of the disease the other *child was sent to* a friend's where no children were and all the usual precautions taken."

The above-mentioned outbreak was limited to the case reported.

Dr. L. A. Warsabo, health officer, city of Coldwater, writes:—

"The patient was kept in a separate room by herself, the house placarded, and the rest of the family were not allowed to communicate with the patient."

Only the one case occurred in the foregoing outbreak.

Dr. Fred K. Smith, health officer of Allouez township, Keweenaw county, writes as follows in regard to a case of diphtheria:—

"No one allowed in the house except the patient, her husband and the physician.—Patient and husband were not permitted to enter any other house until after disinfection."

No other cases occurred in this outbreak, reported by Dr. Smith.

Dr. W. A. S. Williams, health officer of the village of Petoskey, in describing how a patient sick with diphtheria was isolated, says:

"Allowed none to go there except physician and nurse and distributed pamphlets, received from State Board, in immediate neighborhood and giving strict orders that none be allowed to come there or go from there except as ordered. The father of this boy milked some cows in the immediate neighborhood and this I at once prohibited."

Dr. Williams further writes in regard to the above outbreak:—

"This is the second outbreak during my incumbency and in both instances I have succeeded in preventing it from spreading" * * * .

Dr. H. W. Jones, health officer of Houghton township, Houghton county, in reporting two cases of diphtheria, writes:

"The children were brought here sick last week." "Allow none to enter or come out of house, as all the family were in constant contact, and kept them isolated for 10 days after fumigation, disinfection, etc."

In the above instance there was no spread of the disease beyond the two cases mentioned.

Dr. J. E. Scallon, health officer of Hancock township, Houghton county, reports a case of diphtheria as follows:—

"A case of diphtheria exists in the family of Michael Rourke, village of Hancock, Houghton—It is the first case in two years. The house has been quarantined.—The other members of the family isolated and all possible precautions have been and are being taken to prevent the spread of the disease."

The above outbreak was restricted to the one case mentioned.

L. C. Wilber, clerk of Fairgrove township, writes in regard to two cases of diphtheria existing in that township:—

"The township board of health met yesterday, closed and placarded the street, and prohibited all children under 14 years of age from traversing the streets, for the period of ten days. A member of the board will visit every house in the village to-day and inquire into the condition of yards and outhouses; and where thought necessary, cause the same to be cleaned and disinfectants used. Schools have been closed and every measure will be taken to hold the disease in check."

Dr. S. W. Barkwell, writes as follows from Dearborn, Wayne county: —

"There have been eleven cases in all. Three have died and eight have recovered.

"The outbreak was confined to the one family, and not likely to spread, as every care and precaution have been made for its restriction. School was closed for three or four weeks in the vicinity. House plainly placarded, all refuse waters and waste material carefully disinfected and emptied into an excavation, three or four feet deep, prepared for the occasion. All handkerchiefs, clothes and towels used (during this outbreak) by the sick, were burned. The bedding used by the worst cases was also burned. The dead were very carefully guarded and secretly and privately buried."

The following is quoted from the "Menominee Range" of Jan. 10, 1889, in regard to the health officer of Iron Mountain:

"Health Officer Mead was the busiest man in town on Saturday, inspecting premises, and distributing hand bills warning people that diphtheria had appeared in the city in a very pronounced, virulent shape, and that persons holding any personal communication with quarantined houses were liable both to prosecution and fine."

The handbills referred to in the above extract were substantially as follows:—

DIPHTHERIA IS HERE, and has been traced through three different families. Therefore I WARN THE CITIZENS of IRON MOUNTAIN, UNDER THE PENALTY OF THE LAW, to RIGIDLY ENFORCE quarantine regulations in order that this dread disease may be stamped out.

Iron Mountain, Jan. 4, 1889. J. M. MEAD,
Health Officer.

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

In the following table and diagram, in the compiling of which 376 outbreaks* are considered, some of the results of the efforts to restrict diphtheria are shown.

In studying this table it should be borne in mind that the outbreaks considered in the third, fourth, fifth and sixth double-columns are *not* included in the seventh and eighth columns, and that the third, fourth and seventh *are* included in the ninth column. This ninth column is compiled on the same principle as the fourth column in the tables for diphtheria found on pages 212 and 235 of the Reports of this Office for the years 1886 and 1887 respectively. The five double-columns, from the third to the seventh inclusive, in the following table have been worked out for the second time in the present compilation. The object of this is to determine, if possible, the efficacy of either isolation or of disinfection when employed alone for the restriction of diphtheria. It is believed that by continuing this classification for a series of years, data will be accumulated which may yield important information as to the relative value of isolation and disinfection.

In the 376 outbreaks in the following table there were 1,986 cases and 418 deaths, an average of 5.28 cases and 1.11 deaths per outbreak. In the 254 outbreaks in which isolation or disinfection or both were not mentioned or the statements were doubtful, there were 1,314 cases and 280 deaths, an average of 5.17 cases and 1.10 deaths per outbreak. In the 14 outbreaks in which isolation was neglected and disinfection was enforced or doubtful there were 81 cases and 13 deaths, an average of 5.79 cases and 0.93 deaths per outbreak. In the seven outbreaks in which disinfection was neglected and isolation was enforced or doubtful there were 17 cases and one death. In the nine outbreaks in which isolation was enforced and disinfection neglected or doubtful there were 34 cases and six deaths, an average of 3.78 cases and 0.67 deaths per outbreak. In the thirteen outbreaks in which disinfection was enforced and isolation neglected or doubtful there were 80 cases and 13 deaths, an average of 6.15 cases and one death per outbreak. In the 41 outbreaks in which isolation and disinfection were both neglected we have 478 cases and 108 deaths, an average of 11.66 cases and 2.63 deaths per outbreak. In the 63 outbreaks in which isolation and disinfection were both enforced there were 98 cases and 14 deaths, an average of 1.56 cases and 0.22 deaths per outbreak.

In the ninth column (formed by combining the third, fourth and seventh columns to compare with the fourth column in like tables for diphtheria found in the Reports from this Office for the years 1886–7) there are 62 outbreaks with 576 cases and 122 deaths, an average of 9.29 cases and 1.97 deaths per outbreak.

* Whenever a break of sixty days or more has occurred in the progress of diphtheria it has hitherto (in this article) been uniformly regarded as two different outbreaks, but in estimating outbreaks for this table, in those cases in which the second appearance of the disease originated from the first, the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the year; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take complete outbreaks even where they extend from one *year into the next.* This explains the apparent discrepancy between the number of outbreaks here given and *the number given at the* beginning of this article.

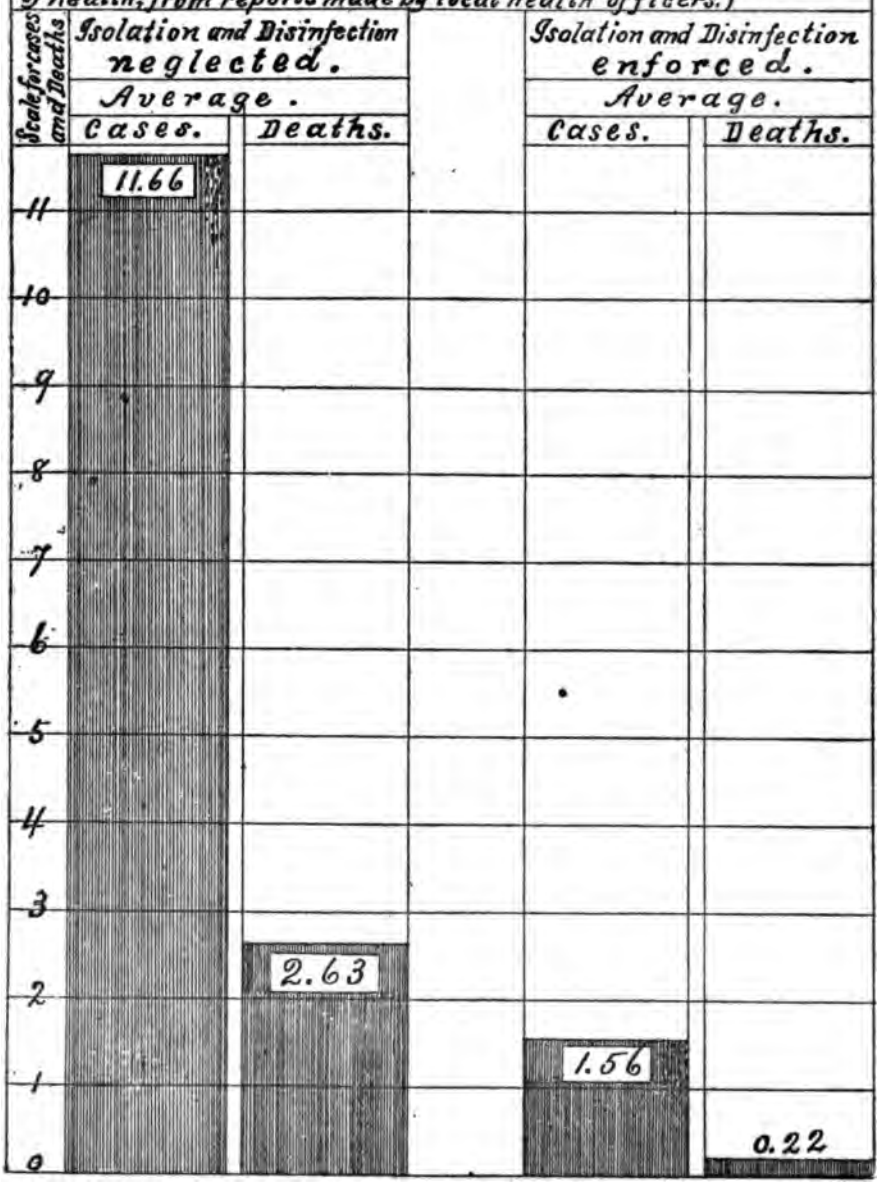
TABLE 6.—*Diphtheria in Michigan in 1889: Exhibiting the Average Numbers of Cases and Deaths per Outbreak:—(1) in all the 376 outbreaks reported; (2) in the 254 outbreaks in which it is doubtful whether or not Disinfection or Isolation was enforced; (3) in the 14 outbreaks in which Isolation was neglected and Disinfection was enforced or doubtful; (4) in the 7 outbreaks in which Disinfection was neglected and Isolation was enforced or doubtful; (5) in the 9 outbreaks in which Isolation was Enforced and Disinfection was neglected or doubtful; (6) in the 13 outbreaks in which Disinfection was enforced and Isolation was neglected or Doubtful; (7) in the 41 outbreaks in which both Isolation and Disinfection were neglected; (8) in the 63 outbreaks in which both Isolation and Disinfection were enforced; and (9) in the 62 outbreaks in which Isolation or Disinfection or both were neglected.*

	(1) All Outbreaks. (376 Outbreaks.*)		(2) Isolation or Disinfection or both not mentioned, or statements doubtful. (254 Outbreaks.)		(3) Isolation Neglected, Disinfection enforced or doubtful. (14 Outbreaks.)		(4) Disinfection Neglected. Isolation enforced or doubtful. (7 Outbreaks.)		(5) Isolat'n enforced, Disinfection neglected or doubtful. (9 Outbreaks.)		(6) Disinfection enforced, Isolation neglected or doubtful. (13 Outbreaks.)		(7) Isolation and Disinfection both neglected. (41 Outbreaks.)		(8) Isolation and Disinfection both enforced. (63 Outbreaks.)		(9) Isolation or Disinfection or both neglected. (62 Outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	1,966	418	1,314	280	81	13	17	1	34	6	80	13	478	108	98	14	576	122
Averages	5.28	1.11	5.17	1.10	5.79	0.93	2.43	0.14	3.78	0.67	6.15	1.00	11.66	2.63	1.56	0.22	9.29	1.97

* These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all the time. See footnote, on page 174.

ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.

Diphtheria in Michigan in 1889:—Exhibiting the average numbers of cases and deaths per outbreak:—in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



Although the data contained in the third, fourth, fifth and sixth columns in the above table seem to indicate that isolation, as compared with disinfection, where only one or the other is enforced, produced the better result in limiting the number of cases in an outbreak, it should not be concluded that because isolation thus seems to be the most potent factor in limiting the number of *cases* in an outbreak, it will have the same effect in limiting the *number of outbreaks.* If disinfection be neglected, the reverse may be realized in the same or in some future year, for the reason that the diphtheria germ retains its vitality for months and even years, and a new outbreak may occur whenever a susceptible person comes in contact with the material which was not disinfected. If we would limit this terrible disease it is necessary, therefore, that disinfection as well as isolation be rigidly enforced.

The above table also seems to indicate that if no restrictive measures had been taken in the 376 outbreaks, and the average for all outbreaks had been 11.66 cases and 2.63 deaths per outbreak, as in the 41 outbreaks in which no restriction was practiced, there would have been 4,384 cases and 988 deaths. Deducting from these the cases, 1,986, and the deaths, 418, which actually occurred, there is indicated a saving of 2,398 cases and 570 lives from diphtheria during the year 1889, by isolation and disinfection. Had the measures of restriction been enforced in each of the 376 outbreaks, as it was in each of the 63 outbreaks in which they *were* enforced, the number of cases would have been only 586, and the number of deaths 83. Deducting these from the number of cases (1,986) and deaths (418) that *did* occur in the 376 outbreaks, there is indicated as having occurred 1,400 cases and 335 deaths from diphtheria in 1889, which could, and should, have been prevented by thorough isolation and disinfection in all outbreaks.

To the health officers and local boards of health who failed to conscientiously and vigorously enforce these restrictive measures, these 1,400 cases and 335 deaths, which might have been saved, must awaken keen regret, and must plead eloquently for increased care and diligence in the future; while to those who enforced isolation and disinfection the 2,398 cases and 570 lives which were thus saved, are great cause for congratulation. This view is strengthened by reference to the following table, from which it may be seen that during the four years, 1886–9, there is indicated the prevention of 12,435 cases and 2,337 deaths from diphtheria alone by isolation and disinfection.*

* Of course the numbers of cases and deaths here indicated as prevented are too small; because, if the outbreaks had been entirely unrestricted, many, perhaps all, of them would have spread into other jurisdictions, and from these into still others, thus causing many more outbreaks, (whenever a disease spreads across the line into another jurisdiction it must then be considered as a new "outbreak,") and these, being unrestricted, would have caused many more cases and deaths; so that there were probably prevented many more cases, and many more lives were saved by isolation and disinfection than the numbers here given.

RESTRICTION OF DIPHTHERIA IN MICHIGAN.

TABLE 7.—*Exhibiting for the four Years, and for each of the four Years, 1886-9, the Number of reported Outbreaks, Cases and Deaths; also, for this four-year Period, the average Number of Cases and Deaths per Outbreak in all Outbreaks; in those Outbreaks in which Isolation or Disinfection was Doubtful; in which Isolation or Disinfection, or both, were Neglected; in which both Isolation and Disinfection were Neglected; in which both Isolation and Disinfection were enforced; and also the Numbers of Cases and Deaths Indicated to have been prevented by Isolation and Disinfection.*

Years.	Indicated Saving of Cases and Lives by Isolation and Disinfection.*		All Outbreaks.†			Isolation or Disinfection, or both, not Mentioned, or Statements Doubtful.			Isolation or Disinfection, or both, Neglected.			Isolation and Disinfection both Neglected.			Isolation and Disinfection both Enforced.		
	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.
1886	4,374	833	461	3,085	656	243	1,103	250	102	1,650	329	‡	‡	‡	116	332	77
1887	2,371	518	398	2,321	561	202	732	190	118	1,391	320	60	822	195	78	198	51
1888	§ 3,292	§ 416	311	1,529	324	199	810	189	60	674	117	34	527	81	58	101	31
1889	§ 2,398	570	376	1,986	418	254	1,314	280	62	576	122	41	478	106	63	98	14
Totals	12,435	2,337	1,546	8,921	1,959	898	3,959	909	342	4,291	888	135	1,827	384	315	729	173
Averages	3,109	584															
Av. cases and deaths per outbreak				5.77	1.27		4.41	1.01		12.55	2.60		‖ 13.53	‖ 2.84		2.31	0.55

† Outbreaks in Detroit and Grand Rapids not included.
‡ This column not compiled for the year 1886.
‖ Average for the three years 1887-9.
* For the years 1886 and 1887, the numbers of cases and deaths in this double column are found by multiplying "all outbreaks" for the year by the average number of cases or deaths per outbreak in the "Isolation or Disinfection or both Neglected" column, for that year, and deducting from the result thus obtained, the cases or deaths, as the case may be, which *did* occur in that year.
§ For the years 1888 and 1889 these results are obtained in the same manner as stated in the (*) footnote above, except that "All Outbreaks" for that year are multiplied by the average number of cases or deaths per outbreak in those outbreaks in which "Isolation and Disinfection both were Neglected."

LIVES AND MONEY SAVED IN MICHIGAN IN 1889 BY RESTRICTING DIPHTHERIA.

As shown in table 6, on page 171, in the 63 outbreaks of diphtheria where both isolation and disinfection were enforced, there occurred, on an average, 1.56 cases and .22 of one death per outbreak, whereas the average per outbreak in the 41 outbreaks in which isolation and disinfection were neglected, was 11.66 cases and 2.63 deaths per outbreak; there was thus a saving of 10.10 cases and 2.41 deaths effected in each of the 63 outbreaks in which the preventive measures were enforced, or in all 636 cases and 152 deaths. Estimating the average cost in each case of sickness, for medical and other attendance, etc., at twenty dollars, the funeral expenses attending each death at forty dollars, and the money value of each life saved at five hundred dollars, these 636 cases and 152 deaths prevented, represent values saved to the State amounting to $94,800, due to the enforcement of preventive and restrictive measures in these 63 outbreaks alone.

In the above-mentioned table it is also shown that in the 254 outbreaks in regard to which isolation and disinfection were not mentioned or the statements made were doubtful, the average per outbreak was 5.17 cases and 1.10 deaths, a difference between this class of outbreaks and that in which isolation and disinfection were known to be neglected, of 6.49 cases and 1.53 deaths per outbreak. This decrease of sickness and mortality in the former class of outbreaks from that of the latter class, is probably due to partial execution of preventive and restrictive measures. It is therefore reasonable to credit these agencies with this decrease, which, for the 254 outbreaks, is 1,648 cases and 388 deaths, which, at the before-mentioned valuations, represent a money value of $242,480. This amount, plus the $94,800 gain, shown in the preceding paragraph, makes a saving to the State, with reference to this one disease, through measures recommended by the State Board of Health, adopted by the local health officials, and supported by the people, of $337,280 during the year 1889.

This apparent saving of over a quarter of a million of dollars to the people of Michigan in a single year by restrictive measures, in a single disease, is very gratifying. There is, however, another view of the case, obtained by evidence not quite so direct and certain, yet sufficiently reasonable and reliable to make it worth while to examine it, as follows:

In Michigan the sickness-statistics are collected by the State Board of Health, the statistics of deaths are collected and published by the Secretary of State. These statistics collected by different departments of the State government, are, as a rule, not put on record, in the localities, by the same persons. Not all cases of sickness, or even all the deaths are reported by either sets of officials, yet it is known that both sets of statistics are very valuable. It is, therefore, interesting and instructive to compare them. In the following paragraphs a study is made of the statistics from these two sources, relating to diphtheria. It seems to show

SOME MONEY LOSSES WHICH SHOULD HAVE BEEN PREVENTED.

The number of deaths from diphtheria reported to the Secretary of State during the year 1889, was 848. Assuming that the deaths so reported, bear the same ratio to cases (21.6 per cent) as exists in outbreaks of the disease reported to the State Board of Health during the same year, as shown in table 3 on page 160, there occurred 3,926 cases of sickness from diphtheria in Michigan during the year 1889. Estimating the average cost of each

case, for medical and other attendance, etc., at the low figure of twenty dollars per case, the money loss to the people of the State, caused by these 3,926 cases of diphtheria, was $78,520; if the funerals cost on the average, forty dollars each, the 848 funerals cost 33,920 dollars; and the 848 lives lost, if the money value of each life was $500, shows a further loss to the State, of $424,000, making a total of $536,440.

Calculated on the basis of the average number of cases (5.28) per outbreak, in the 376 outbreaks reported to the State Board of Health in 1889, the 3,926 cases mentioned in the preceding paragraph represent 744 outbreaks as having occurred in the State during the year. Had the preventive and restrictive measures recommended by the State Board of Health, been enforced in all these 744 outbreaks, with results similar to those obtained in the 63 outbreaks in which they were enforced (1.56 cases and .22 of one death per outbreak) shown in column 8 of the table on page 171, there would have occurred only 1,160 cases of this disease in the State, or 2,766 cases less than actually did occur; and a consequent saving in sickness expenses (at $20 each) of $55,320 would have been effected; the number of deaths would have been reduced from 848 to 164, a decrease of 684, which would have saved the expenses attending 684 funerals (at $40 each), $27,360; and 684 lives worth (at $500 each) $342,000. It thus seems evident, that during the year, the State sustained losses from diphtheria alone, amounting to $424,680 which might and should have been obviated. But had all the 744 outbreaks of diphtheria been entirely neglected, there is good reason to believe that there would have occurred in the State, according to the evidence in the tables, 11.66 cases and 2.63 deaths to an outbreak,—a total of 8,675 cases and 1,957 deaths, which would have occasioned a money loss of $1,230,280. Subtracting from this, the actual loss, previously computed to have been $424,680, there remains $805,600 which it appears were saved to the people of Michigan in 1889, by restrictive measures applied to that destructive disease—diphtheria.

But whether we conclude that this particular saving, from this disease in 1889, was something over a quarter of a million, or over half a million of dollars, enough is now known to make it certain that the health measures which have been inaugurated in Michigan, are of very great importance, in a financial as well as a humanitarian way,—of much greater importance than any of the most sanguine supporters of the measures have claimed that they would be.

HOW DIPHTHERIA IS SPREAD,—TRANSGRESSIONS OF PUBLIC HEALTH LAWS.

Frequently reports reach this office of persons infected with the contagium of diphtheria being permitted, in violation of the health laws of the State, to go from one family to another, to go upon the public streets, or to public or social gatherings, to go from one jurisdictiou to another, and to travel upon the railroads, etc. To these transgressions of the laws, we can ascribe a large percentage of the outbreaks of this disease in our State. In a great many instances health officers fail to thoroughly isolate patients or to disinfect their rooms and clothing, thereby allowing the germs of the disease to remain, to cause other outbreaks at some future time; others allow public funerals, or the bodies of decedents from diphtheria to be conveyed from one point to another, scattering the contagium of the disease through the land.

Other lamentable facts in regard to this subject are, that the proper

authorities sometimes fail to comply with the law which provides for the appointment of health officers in their jurisdictions; and that physicians and householders transgress the law by neglecting to report to their health officers, cases of communicable diseases which come to their knowledge, or occur in their houses; and that householders fail to coöperate with health officers in their efforts to restrict communicable diseases; and even resist their attempts to stamp out those diseases by the performance of duties prescribed to them by law.

The following are extracts from letters and reports received at this Office, bearing on this subject:—

Dr. A. E. Anderson, health officer of Iron Mountain, Menominee county, wrote to the Secretary of the Board as follows:—

"I would request your board to inquire of the authorities of Wisconsin, why the health officer of Florence, Wis., (a place 14 miles from here) does not enforce ordinary means of precaution in cases of diphtheria. I will furnish proof that the only thing done is to post a card, and when the disease is over, take it down. I can trace nearly every case that we have had in the last two months to places adjoining, in Wisconsin."

The Secretary submitted Dr. Anderson's report to the Secretary of the Wisconsin State Board of Health. A few days later Dr. Anderson again wrote to the Secretary as follows:—

"I have had some correspondence with Dr. Reeve, Sec'y Wisconsin State Board of Health, and I have given him such information as my time permitted me to obtain.

"I desire to see this matter pushed to the utmost, because it is impossible for us to stamp out the disease, even though we resort to police quarantine in most cases, as long as no precautions are taken in adjoining places. To illustrate, to-day a patient, adult, lady, came to me just after recovering from diphtheria, to be treated for a consequent paralysis of the soft palate. She brought a boy 5 or 6 years old with her that had also just recovered. Came to my residence and waited an hour for me to come home. I took her to my office and after prescribing for her I obtained a written statement from her, that no precaution had been taken in her house, not even a card being posted, although 3 children had died in the house. This statement I forwarded to Dr. Reeve, Sec'y Wisconsin Board."

A physician residing in Luce county, wrote to the Secretary as follows:—

"According to my diagnosis diphtheria has been prevalent here for nearly two months. Both the health officer and the local board of health have taken no steps to restrict its spread; at least, no important or necessary steps, usually taken. The health officer and the only other physician here besides myself, have contended that there was no diphtheria in the village. Within the past few days, through public pressure, they have partially admitted its presence. Some 20 cases have occurred and three deaths.

"Every move I have made to restrict its spread they have opposed by declaring that there was no such disease prevalent. The health officer declared to the principal of the high school that there was no danger to the public by contagion, and the health officer permitted the principal to attend to the laying out of one of the children who had died, without any precaution. A few days after another child died in the same family. I think they were both scholars in the school.

"The disease still continues to spread and no precautionary steps are being taken.

"I have contended that the disease is diphtheria, but the cases I have reported to the health officer and to the village board have not induced them to take any steps to restrict the spread of the disease. Something must be done, as the situation is becoming very dangerous. The situation justifies the appointment of a committee to investigate it, by the State Board of Health. * * * lives are being lost by it and I have children of my own to protect.

A correspondent writes from Grass Lake township, Jackson county:

"I wish to call your attention to sickness in this neighborhood that has been running two weeks nearly, pronounced by physicians to be diphtheria. I understand this town, Grass Lake, has no health officer and it seems we are not likely to get one unless by your help. We buried a boy yesterday, and to-night a babe will be laid to rest.

"The mode of burial is what strikes me as unsafe. Some neighbor gets the coffin and leaves it at the house and the family puts the corpse inside and then puts it out of doors, then neighbors come and cart to the place of burial.

"I understand the health officer must be notified and he must take personal charge of the burial. To-day a coffin was procured and it being too short, was taken back and another procured, thereby causing a delay of 3 or 4 hours in burial. And to-night another case is reported that has been running two or three days without a physician.

"We, as a community, respectfully ask you to do all in your power to give us proper aid in stopping this dread disease and to give premises where the disease has been, proper disinfection."

There occurred twelve cases and two deaths during the outbreak of diphtheria referred to in the above letter.

On the twentieth of December, a letter was sent to the Prosecuting Attorney of Jackson Co., stating that a demand had been made on April 6 for the return of the name of health officer of Grass Lake township, referring to the law requiring this and stating that no return had been received and that the township of Grass Lake was then suffering from an outbreak of diphtheria there being no health officer as required by law to stamp it out. The letter called attention to the fact that the number of deaths and cases already exceeded the number which occur where prompt precautionary measures are taken, and attributed this excess to the neglect to comply with the law. The letter asked in conclusion if the failure to appoint a health officer was not a violation of official oath, and if it did not come under the law requiring the prosecuting attorney to prosecute.

In reply the following communications were received from the prosecuting attorney:

"*Jackson, Mich., Dec. 21, 1889.*

DR. HENRY B. BAKER, *Sec'y State Board of Health, Lansing, Mich.:*

"DEAR SIR:—Your communication relative to the neglect of the Grass Lake authorities to appoint a health officer is at hand. I will give the case prompt and careful attention and communicate to you the result of my investigations. I have already notified the Supervisor of my desire to see him; but business may require my absence from the city until Christmas. I wish to act in strict accordance with my official duty and take such course as will be approved by yourself.

Very respectfully yours,
J. A. PARKINSON."

"*Jackson, Mich., Dec. 27, 1889.*

HENRY B. BAKER, M. D., *Sec'y State Board of Health. Lansing, Mich.:*

"DEAR SIR:—I have made such investigation as has been practicable into the matter growing out of diphtheria in Grass Lake township, with the following results: Diphtheria appeared in the southeast part of the township known locally as "Fishville" about Dec. 8th or 9th. It is supposed to have first occurred in the family of Frank Knickerbocker; although he and his family insist their sickness was not diphtheria. If it was not, then the first case was in the family of Crandall Fish. Knickerbocker's daughter was working in Jackson and went home sick. The authorities think her case was diphtheria and originated in this city. There have been in all twelve cases, two resulting fatally. Of these two, one was a babe of about 18 months, and the other a boy about twelve years old, but one who was not healthy, who was asthmatic and otherwise infirm, with impaired constitution. All other cases are now convalescent.

"In Grass Lake township is Grass Lake village. The village had a health officer, Dr. H. J. Hale. On the breaking out of diphtheria, the supervisor, A. A. Corwin, visited the locality twice, ordered all the families where sickness prevailed to keep quarantined and distributed documents furnished by the State Board of Health giving instructions as to use of disinfectants, etc. Dr. M. H. Raymond also informs me that Dr. Hale, the village health officer, assumed and discharged the duties of township health officer on the breaking out of diphtheria. Dr. Raymond also says there is now only one case in that vicinity, that of a girl about 12 years of age. I quote further from his letter, as you probably knew the gentleman who was a few years ago a representative from this county in the legislature. He says: 'Every precaution has been taken and is being taken now to prevent the spread of the disease. Had there been health officers properly appointed no better methods could have been taken to prevent the spread of the disease than have been adopted.'

"Speaking of the township board, Dr. Raymond says: 'I think the township board has appointed a

health officer to-day. They have not intentionally defied the law; it has simply been carelessness and in my judgment no harm has resulted.' His letter bears date Dec. 24.

"I learn from the supervisor, Mr. Corwin, that the cases were treated by Dr. D. Hyndman, of Norvell, and Dr. H. J. Hale and Dr. Raymond, of Grass Lake. A physician, one or more, had charge of each case. The township board has taken action and appointed a health officer.

"As to the law, I do not feel prepared to give a final opinion. But I do not find any penalty or forfeiture specifically provided for not appointing a health officer or not performing any other duty under Chapter 39 of Howell's Statutes. Section 8442 to which you directed my attention provides for prosecutions for *penalties* and *forfeitures*. It could not apply to this case, if no express penalty or forfeiture is provided by the statute for the neglect complained of.

"Sec. 9259 makes *willful* neglect to perform official duty enjoined, when no special provision is made for its punishment otherwise, a misdemeanor.

"Sec. 9261 fixes the punishment at imprisonment in county jail not more than a year or fine not exceeding $250, or both.

"To convict, a jury must be convinced that the neglect was *willful*. The difficulties, if this is the provision covering this case, would be in respect to the proof. *Was the neglect willful?* I call your attention to this feature and would like to have you consider whether we better, on the whole, risk bringing these people before a jury. They are now wide awake to the situation, and will not soon forget the lesson. It is doubtful if actual harm has been done, at least harm resulting in avoidable fatality. I wish to take such course as is best for the public interests and as will meet your approval.

Very respectfully,

J. A. PARKINSON."

The township officers still being delinquent, a letter was sent to the prosecuting attorney asking him to urge the township officers to return the name of the health officer to the State Board of Health. Shortly afterwards the name of H. G. Hale was duly returned in accordance with law, as health officer, and he commenced making the weekly card reports.

L. A. Houghton, M. D., health officer of Rolland township, Isabella county, in reporting an outbreak of diphtheria which occurred in that township, and which resulted in six cases and one death, writes:—

"This outbreak is supposed to have been brought from Webberville by a family by the name of Burch, who claim that the sickness which they had just before coming here was not diphtheria. Were such cases reported to you? Had he told that his was diphtheria the last four cases could have been avoided by keeping them from it."

In regard to the same outbreak, the father of the children who were afflicted with the disease, writes as follows:—

"Diphtheria broke out in my family and we had one child die and five others sick. I had a girl working for Herbert Childs and she was taken sick with a sore throat and white on her tonsils, and they kept her there one week and never called a physician or sent me word; but sent her home and in three days after, two of my children were taken sick. I called Doctor Roller of Edmore. He pronounced it diphtheria. Herbert Childs hired a miller from Webberville, by the name of Charles Burch. His wife, whom he left in Webberville, wrote to him that his children had diphtheria and he went down and in two weeks brought home one of the children, and in another week his wife and two more children came here. They said it was not diphtheria that his family had, but his boy told that the health officer in Webberville put a card on the gate saying diphtheria and his mother tore it down. Now sir, what I want is you to find out from the health officer at Webberville if Charles Burch's family did have diphtheria, and if he moved without a certificate of health from the health officer; also let me know if Herbert Childs is liable to prosecution for the way he used my girl."

Another health officer wrote to the Secretary as follows:—

"Dear Sir:—Will you kindly give me your opinion on the following case. The family of Mr. H——— are sick with diphtheria. A neighbor, Mrs. W—— volunteers to act as nurse to this family. She goes there and nurses a few hours, then she says she changes her clothes and disinfects them * * * then

goes over to her own house. Mrs. W—— has a daughter who works out, in a family where the woman was confined only recently, * * * . The daughter goes home and comes in contact with the mother, there are also younger children at Mrs. W——'s who mingle more or less with outside people. Now Dr., I, as health officer, *forbid* Mrs. W——— from running back and forth between her own house and that of Mr. H——. Did I do right or wrong? * * * . Mrs. W—— after visiting her home yesterday and Sunday has sore throat *now*. This lady who is recently confined, where Miss W—— is working has had some sore throat * * * . Mrs. W—— has a married daughter * * * also a younger daughter living with the married daughter, this young girl had diphtheria very bad; as soon as she was able she comes home to her mother's—Mrs. W.'s. All of Mrs. W.'s children (5) had sore throat afterwards, or while this girl was convalescing, but went to school more or less, country school, 45 scholars, a week or so afterwards diphtheria started, in that school. No other children in the township had had it, but six cases have developed from that school, one death. I have raised a hornet's nest about my ears because I am so strict about quarantine. * * * ."

The following is an extract from a letter from Dr. Wm. F. Reus, health officer of Holland township, Ottawa county:—

"In reply to yours of 21st inst. permit me to say that, the outbreak of diphtheria originated in Holland City, over which I have no jurisdiction, from thence it spread into my territory, resulting in 3 cases two of which died * * * * .

"The cases were not reported to me as required by law, and my first information was obtained after the two deaths had occurred

"I have sent notices to the newspapers requesting physicians and householders to report to me as required by law."

N. D. Lee, M. D., health officer of Saginaw City wrote to the Office of the Board, Sept. 30, 1889, as follows:—

"Diphtheria on the increase, becoming epidemic, I am afraid partly owing to carelessness of householders and physicians, mostly owing to the epidemic across the river exposing people in Saginaw."

Dr. Leon A. Warsabo, health officer of Coldwater, in reporting the source of contagium in an outbreak of diphtheria which occurred in that city writes:

"This last case was originated from the house where people who lived and moved out were affected, as near as I can find out with diphtheria, but did not report, consequently the house was not disinfected when new family moved in."

Dr. E. Bigham, health officer of the township of Du Plain, Clinton county, in reporting the source of contagium in an outbreak of diphtheria which resulted in twelve cases and three deaths, says:—

"Children contracted disease from contagium while attending school. I have written to other physicians who treated some of these cases three times at least, but no answer."

John L. Covert, health officer of Vergennes, Kent county, wrote, in regard to an outbreak of diphtheria in his jurisdiction:—

"No report from family or Doctor." "It is almost impossible to get the people to make reports, though I think there has been some improvement the last year. Our Doctors all live in Lowell village and have been very careless. I have about made up my mind to prosecute after this for violations of the law."

The health officer of another township, where one hundred cases of diphtheria occurred during the year, twenty of which proved fatal, in reporting an outbreak of that disease, wrote as follows:—

"Inclosed you will find report of an outbreak of diphtheria * * * which I learned of through

the kindness of a neighbor. Dr. —— of this city is the attending physician, and passes my residence to call there; but he has not reported to me. The Doctors are very negligent for some reason, * * about reporting to me."

The following letter was received from Horace Fox, Clerk of Rich township, Lapeer county:—

"*Secretary of the State Board of Health, Lansing, Mich.:*

DEAR SIR:—On Oct. 12, inst., notice having been given me that Diphtheria had appeared in the family of J. B. McIntyre, in the township of Rich, Lapeer Co., I immediately employed W. B. Curtis, a physician of long practice, residing in the village of Mayville to investigate and report regarding the existence of such disease. Upon arriving at the premises he met Dr. Henrys, Mr. McIntyre's family physician, and both decided that such disease existed and united in placing up the usual Diphtheria notice and instructed me to have the house and premises closed. Mr. McIntyre not then being at home. On the 14th I saw Mr. M. and ordered him to remain on the premises and keep his family there; and this he promised to do, but has failed to do so; and now absolutely refuses to stay upon the premises but permits himself to be at large visiting other families and places and disregards all requests and orders from the board of of health to prevent the spreading of said disease. John Stephens, our health officer, is now absent and I desire to know what I shall do, or what you will do, to prevent the spreading of this terrible disease. It seems to me that stringent measures should at once be taken to prevent this calamity.

"Please advise at once what will be done in this matter."

Dr. G. W. Hathaway, health officer of the city of Lapeer, in reporting an outbreak of diphtheria, wrote:—

"Both girls came from a distance to the same house in this city and in 4 to 7 days both were taken and died. The family of this house have been sick, of what I do not know, but from all I can learn the children have had diphtheria and it has been denied by them and the physician until the physician saw that these two girls were going to die. Both girls were allowed to come there visiting."

The following are extracts from two letters written to the Secretary, by J. M. Gallery, M. D., health officers of the city of Eaton Rapids:—

"The fact of the matter is there was no Health Officer appointed last year and so I paid little attention to it. I was appointed some four week ago, for the remainder of this year and will try to do much better in the future. Enclosed please find report as per request. Two of the cases I attended myself, the other two (one of which died) were attended by Dr. Knight who made no report at all to me and I report them only from hearsay.

"I send you card to-day reporting a case of diphtheria which was not reported to me until after recovery. The other case was reported to me Monday night, first taken Friday night, died last night. Prospect bright for an epidemic. * * "

C. S. Park, M. D., health officer of Hubbardston, Ionia county, in a letter to the Secretary of the Board, in regard to a case of diphtheria, wrote as follows:—

"I know that health officers in neighboring towns—many of them—never disinfect a house after diphtheria, unless patient dies. Non-medical men usually think that if a case recovers it was not diphtheria. * * * ."

The following is an extract from a letter received by the Secretary of the Board from N. D. Lee, M. D., health officer of Saginaw city:—

"I am having a great deal of bother and trouble with diphtheria — though the diphtheria in our city is running in a very light form and I am trying as well as I can to control the spread of the contagion and have in every instance—nearly—in our city; but the mischief and trouble lies in the carelessness or negligence of the adjacent towns, villages and cities. We have on our north line, the village of Carrollton with malignant diphtheria, so reported to me, and on our east line, the city of East Saginaw, with diphtheria in a lighter or milder form, and from these places we keep continually exposed to this disease

through the intercourse and carelessness of the people, and negligence of proper sanitation in these places; and I know of no way to prevent it, only to fight it as it comes.

"I am in the firm belief, that we should have a National, State, County, Town and City Board of Health, with full power for control—completely—where neglected by local authorities, for the stamping out of disease, before we can get complete control of the diseases dangerous to the public health; and there are very few if any questions that come up in the halls of Legislature, that are of more importance for the good of the people of this country, than the question of how best to preserve the health of the public, or sanitation."

PERIOD OF INCUBATION, IN DIPHTHERIA.

TABLE 8.—*Exhibiting the reported Period of Incubation, stated in days, in one hundred and thirty-nine cases of Diphtheria. Compiled from reports of health officers in Michigan, for the year 1889.*

Incubation period—Days	1	2	3	4	6	7	8	10	12	13	14	15
Cases in each period	12	7	7	18	8	17	43	9	2	10	5	1

The average period of incubation of diphtheria in the one hundred and thirty-nine cases is 6.9 days. It will be observed, however, that many more cases (43) were reported "8" days, than any other number.

TABLE 9.—*Exhibiting, relative to Diphtheria in Twenty Instances in Michigan in 1889, the Reported Period of Incubation, within certain Limits, stated in Days; also the Means, the Average of which may Represent the Average Period of Incubation.*

Days (In four Instances).	Means.	Days (In four Instances).	Means.	Days (In four Instances).	Means.	Days (In four Instances).	Means.	Days (In four Instances).	Means.
1 to 7	4.0	3 to 4	3.5	4 to 7	5.5	6 to 7	6.5	7 to 8	7.5
2 to 3	2.5	3 to 4	3.5	5 to 6	5.5	6 to 9	7.5	7 to 9	8.0
2 to 3	2.5	3 to 4	3.5	5 to 7	6.0	6 to 9	7.5	7 to 14	10.5
2 to 10	6.0	3 to 6	4.5	5 to 19	12.0	7 to 8	7.5	4 to 9	6.5

The average of all the means, for the 20 instances, is 6 days.

HOW LONG WILL THE GERM OF DIPHTHERIA RETAIN ITS VITALITY?

The following are a few extracts from letters and reports, received from health officers of the State, which bear on this question:—

1.—"Supposed to be contracted from articles bought of a family who had the disease last year."

2.—"About three years ago the family lost three children from diphtheria in the same house. They took some of the clothes worn by at least one of the children who died and packed them away in a trunk without even washing, and kept them there until two weeks ago, when they unpacked them, and the patient now sick, commenced wearing a dress that was worn by one of deceased.

3.—"Source of contagium in first case, probably, case of 'membranous croup' in same house, ending fatally a year ago."

4.—"A child died in same house eight years ago with same disease."

5.—"A case of diphtheria occurred in this village with fatal result on Tuesday, the 28th, of last month; and now the Dr. reports mother and sister of the same family down with same disease. Cause, I think, is a child died in the same house a few years ago."

DIPHTHERIA CONTRACTED FROM A SICK COLT.

Dr. William E. Allen, health officer of Byron township, Kent county, reports as follows in regard to an outbreak of diphtheria in that township, which resulted in four cases and two deaths:—

"Your letter to me was the first information I had that diphtheria was present in this township. I at once visited the cases, found one had died and another was dying. Two had recovered (nearly).

"No source of contagium could be found, unless it was from two colts which had 'distemper', both of them broke under the throat, one of them died. The boy who first had Diphtheria took care of these colts, and the father said 'the boy's breath smelled just like the colts'. This boy, aged 7 years, had it very mildly, no physician, didn't know what ailed him, used gargle, he recovered. The others, no doubt, took the disease from him."

CONTAGIUM SUPPOSED TO HAVE BEEN CARRIED BY ATTENDANT PHYSICIAN.

A township health officer who had reported the source of contagium, in an outbreak of diphtheria, as—"by the physician", when requested by the Secretary of the State Board of Health to explain more fully, replied as follows:

"Mrs. ——— was sick in child bed, Dr. - ——— was sent for. At the time he was attending a family in ——— sick with the diphtheria. The evening before he came to Mrs. ———'s bedside, he performed an operation on the throat of the child. Mrs. - —— got along well with childbirth. The baby to all appearance well and strong. The child lived about ten days, then died, the Dr. said from an abcess; but Mrs. ———'s people think it was diphtheria. About two days after the child died Mrs. ——— was taken with diphtheria. The Dr. was called, seemed to be very much surprised, said he thought she must have caught it from some one who attended the funeral; but no one who attended had had the diphtheria, nor has any one (except the family) had it since then. Mrs. ———'s people think without doubt the Dr. brought the contagium with him from the patients he had in the City, and gave it to the child at its birth. They blame the Dr. very much for not telling them what to do in the first case. I was not informed of any case of diphtheria until Mrs. —— had recovered from the attack."

PAMPHLETS ON RESTRICTION AND PREVENTION OF DIPHTHERIA.

The high appreciation in which the pamphlets on the "Restriction and Prevention" of communicable diseases, issued by the State Board of Health are held, is demonstrated by the many applications made to the Office of the Board for those documents, by local health officers and others throughout the State. The following extracts from letters and reports containing such applications, leave no doubt that the said documents are prized as an efficient aid to local health officers in their efforts to restrict and stamp out dangerous communicable diseases:—

1.—"I have only three German and two English pamphlets on diphtheria. I can do more good with one of these pamphlets in a family afflicted with a contagious disease, than I can to talk a week."

2.—"Please send me fifty documents, at least, for the restriction and prevention of diphtheria, in English."

3.—"Please send me about 300 leaflets on prevention, etc., of diphtheria and scarlet fever. If there are charges, bill M. Fenn, Recorder. * * * ."

4.—"This is the second outbreak of diphtheria traceable to immigrants. There is a large settlement of Danes in Sidney, and they seem prone to diphtheria, although they say that they know nothing of the disease in their own country.

"I wish you would be so kind as to send documents printed in their language, for distribution among them."

5.—"I have only two documents left for the restriction and prevention of diphtheria, in German, and need at least fifty more. I can do more with those documents among the Germans than in any other way. They have to be educated."

6.—"I had reported to me last night two cases of diphtheria * * * . School children, attended by a German physician, I have attended to their sanitary regulation as well as I can. They cannot understand me or I them very well. The cases are in a dangerous neighborhood. If you have anything in German, French, or English in print, in regard to the prevention of diphtheria, especially in German, please send it to me. Such things please the Germans very much, especially when it comes from the State authorities. Please send me enough, if you can, so that I can have a few for distribution."

EXPRESSED NEED OF A HEALTH INSPECTOR.

The following extract from a letter received by the Secretary of the State Board of Health, from A. E. Anderson, M. D., health officer of Iron Mountain, expresses a growing feeling of the need of a health inspector, who, under the direction of the State Board of Health, shall visit localities afflicted with epidemics of dangerous communicable diseases, and aid local health authorities in controlling such epidemics:—

"Would also suggest, that a great deal more good may be done if the Michigan State Board of Health would send a man around to the different towns and cities and see if the health officers carry out any part of the duties described in the circular sent out by the Board.

"This last matter is *well worth your serious attention.*"

HINDRANCES TO PUBLIC-HEALTH WORK.

The following letter shows a regrettable source of hindrance to public-health work which is occasionally manifested. In the instance referred to, the expenses were incurred in caring for patients suffering from diphtheria:—

"MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Mich., May 14, 1890.

To AUGUST C. COOK, *Prosecuting Attorney of Menominee County, Menominee, Michigan:*

DEAR SIR:—Complaint reaches this Office that bills for "nurses and other assistance and necessaries", supplied by the board of health of Quinnesec township, in accordance with § 1647 Howell's Statutes, have been cut down, and some rejected by the Board of Supervisors in your county, whereas the law says that such expenses shall be "at the charge of the county", § 1647 Howell's Statutes.

This is a very important law in the interests of public health, because the restriction of dangerous communicable diseases cannot be done by boards of health among poor people where such diseases most commonly occur, without action under this law.

Such action by boards of Supervisors practically negatives the local public-health service throughout the county, because health officers are thereby given to understand that if they carry out the law and restrict the diseases they will not be supported by the Supervisors, and some of them question whether they may not risk having to pay the expenses themselves.

Permit me to ask your attention to the following decisions by the Supreme Court, bearing upon this subject: Third Michigan report, p. 475; Fifty-first Michigan, p. 527; Fifty-eighth Michigan, p. 454, where it is held that the Board of Supervisors must pass such accounts, and can be compelled by mandamus to do so, that they cannot refuse on the ground that the patients were themselves able to pay or that sundry tax-payers considered the charges exorbitant.

Will you have the kindness to place this subject before your Board of Supervisors as soon as practicable?

The disease (diphtheria) which was the cause of this correspondence, is one of the most dangerous with which the health officers of this State have to deal, and it is one which can be restricted, if the laws are enforced,—as you will see by a diagram which I enclose herewith. The comparative danger in Michigan from diphtheria and small-pox is shown by another diagram sent herewith, and wherein the deaths in Michigan from diphtheria are accurately shown in comparison with deaths from small-pox.

I trust that the supervisors in your county will, so far as possible, maintain the local boards of health in their efforts to restrict this disease.

Very respectfully,
HENRY B. BAKER,
Secretary."

SMALL-POX IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1889.

During the year ending December 31, 1889, there were reported to the office of the Michigan State Board of Health, 57 cases of sickness from small-pox, 4 of which resulted fatally. Although these cases and deaths were reported from 14 localities, there occurred actually only 12 *new* outbreaks of the disease in as many localities, during the year. Twenty-four cases and 2 deaths, which are included in the total numbers of cases and deaths reported as having occurred during the year 1889, were parts of outbreaks in Azalia and Deerfield, which began in 1888. During the year 1889, small-pox was reported present in nine counties as follows: Allegan, 1 case; Calhoun, 1 case; Cass, 3 cases; Eaton, 1 case; Lenawee, 6 cases, 1 death; Monroe, 26 cases, 3 deaths; Muskegon, 4 cases; Washtenaw, 6 cases; Wayne, 9 cases.

Of the twelve new outbreaks which were reported during the year, five were restricted to one case each, one to two cases, two to three cases, two to four cases, and one (Detroit) to nine cases.

SOURCE OF CONTAGIUM.

The sources of contagium in the above mentioned 12 new outbreaks, as reported by health officers, were as follows: "Unknown" one instance; "Brought from Detroit," one instance; "Chicago," one instance; "Azalia," two instances; "Denver, Colorado," one instance; "From Lyons, N. Y." one instance; in the other four instances nothing was reported in regard to the source of contagium.

PERIOD OF INCUBATION.

There were only two outbreaks in which the period of incubation was mentioned—one, at Azalia, in which the average period was stated at twelve days, and the other at Muskegon City, in which, for two cases, it was given as sixteen days.

SMALL-POX IN MICHIGAN IN 1889 COMPARED WITH PRECEDING YEARS.

The following table exhibits the number of reported cases, deaths, etc., from small-pox in the State of Michigan for the eight years ending December 31, 1889:

TABLE 1.—*Exhibiting for each of the Eight Years, 1882-9, the numbers of reported Localities, Outbreaks, Cases, Deaths, Average number of Cases per Locality, Average number of Cases per Outbreak, and per cent ratio of Deaths to Cases of Small-pox in Michigan. Compiled in the Office of the Secretary of the State Board of Health, from reports made by local health officers.*

Years.	Localities.	Outbreaks.	Cases.	Deaths.	Average Number of Cases per Locality.	Average Number of Cases per Outbreak.	Ratio of Deaths to Cases. Per Cent.
1882	61	.....	589	159	9.7	.....	27
1883	8	.....	29	2	3.6	.....	7
1884	5	4	22	3	4.4	5.5	14
1885	9	9	27	6	3	3	22
1886	4	4	*24	7	6	6	29
1887	2	4	† 4	0	2	1	0
1888§	11	12	42	6	3.8	3.5	14
1889	14	‡14	57	4	4	4	7

* Includes two cases varioloid.
† Includes one case varioloid.
‡ This number includes two outbreaks which began in 1888, but the majority of cases and deaths in which, occurred in 1889.
§ The numbers in this line, in a similar table on page 273 of the Annual Report of this Board for the year 1889, erroneously contained 18 cases and one death at Azalia which occurred in 1889; the numbers here given for 1888 are the correct ones.

Of the fourteen localities where small-pox prevailed during the year 1889, there was but one—Azalia, an unincorporated village of Milan township, Monroe county, in which there were many cases of the disease.

SMALL-POX OUTBREAK AT AZALIA, MONROE COUNTY.

The history of this outbreak, which began in December, 1888, was partially related in the Annual Report of this Board for the year 1889, and was as follows:

There was small-pox at Howell. A Mrs. Heath, with her son, who had been recently vaccinated, went from Howell to Azalia to visit relatives. While there the Heath boy became sick with varioloid, which was not recognized, but the disease was diagnosed as chicken-pox and consequently no precautionary measures were taken. People went to and from the house where the Heath boy was, and Mrs. Heath visited other families in the neigborhood. Thus a large number of persons were exposed to the contagium of the disease before it was known to be varioloid. Mrs. Heath and her son returned to Howell. A few days later Mrs. Ball, grandmother of the Heath boy, and at whose house the Heaths had stayed while at Azalia, was taken sick with supposed chicken-pox. Mrs. Ball's husband also became sick of the same disease. A man, who boarded at the Balls' house while the Heaths were there, went to Deerfield, and in a few days came down with small-pox. Up to this stage of the outbreak, the disease still being supposed to be chicken-pox, no measures had been taken to prevent its spread. When it became known that the disease from which Mr. and Mrs. Ball were suffering was small-pox, knowing that a great many persons had been exposed to the contagium of the disease, the people of the village, and township generally, became alarmed, wrote to the Secretary of this Board complaining of negligence on the part

of their local board of health and health officer, and requesting that this Board afford them protection against the ravages of the disease. It was not until Jan. 8 that the health officer was informed by the attending physician, that the disease was small-pox. As soon as the health officer learned the true nature of the disease he placed placards on the houses where cases of the disease were known to be, a meeting of the local board of health was called, and active repressive measures were begun. Persons known to have been exposed to the disease were isolated, among whom was the health officer of the township. As the township extended over a large area, a committee of six citizens was appointed to represent the local board and health officer, and invested with power to adopt all necessary means of stamping out the disease.

This committee found it impracticable to act, because it was claimed that the Board of Supervisors of Monroe county would not allow bills incurred in public health work; consequently nothing could be purchased, and labor could not be employed through fear of not receiving pay. The committee appealed to the State Board of Health for help in this emergency, and was informed that a state appropriation might possibly be used in this instance. The committee visited Lansing, and appealed to the Governor for the use of a portion of the money appropriated by the State. It was represented to the Governor that, unless the State took action, the small-pox was likely to spread somewhat widely around the State.

In order to aid the local authorities in preventing the spread of the disease from Azalia, Governor Luce authorized the expenditure of $400, from the amount ($10,000) appropriated by the Legislature for that purpose, by Act No. 230, Laws of 1885. A copy of the Governor's order permitting the above-mentioned expenditure, is as follows:—

LANSING, Mich., Jan. 24, 1889.

WHEREAS, The Legislature did by Act No. 230, Laws of 1885, appropriate $10,000 to be used to prevent the introduction or spread in this State, of cholera or other communicable diseases dangerous to public health, to be used in the discretion of the Governor for the purposes for which it was appropriated, and

WHEREAS, Small-pox is prevailing to an alarming extent at Milan, Monroe county, and whereas the chairman of the Board of Health of said town has been exposed to the disease, and is now in quarantine, so that they have no full organized or authorized Board of Health to discharge the duties incumbent upon it;

THEREFORE, I do authorize those acting as health officers and in charge of the sick, to incur expenses to a limited extent, in preventing the spread of the small-pox within the State, and authorize them to send the bills to the State Board of Health, to be by them presented to the Governor for approval, and it is ordered and directed that no part of the money to be expended by the State shall be used in other than efforts to prevent the spread of the disease. No bills for the treatment of patients except in cases where it is necessary to prevent the spread of the disease will be allowed or paid by the State. Bills for nurses in the pest houses may be presented, but only in cases where the houses have been declared to be pest houses.

Not more than four hundred dollars can be used by virtue of this order.

CYRUS G. LUCE, *Governor.*

The committee returned at once to Azalia, and commenced vigorous action for the restriction of the disease. A competent physician was procured to take care of the cases, nurses were obtained from among the senior class of medical students at the University at Ann Arbor, three houses at which there were already cases of the disease, were converted into temporary hospitals, to which all persons who were subsequently taken with the disease were removed, schools were closed, general vaccinnation was recommended and urged. The railroad trains which, previous to this outbreak, had stopped at Azalia to take on passengers and mails, ceased to do so.

The Secretary of the State Board of Health learned this fact, and, that in consequence, letters were sent (without disinfection) from Azalia to other places to be mailed; and fearing that the disease would be spread by this means, took steps to have the trains stop at Azalia long enough to take on the mails, *after they had been thoroughly disinfected.*

This outbreak of small-pox at Azalia began about December 20, 1888, and ended about March 10, 1889. During the outbreak there occurred 19 cases of sickness and one death from the disease. Contagium from this outbreak was reported to have been carried to four other localities, Deerfield, Dundee and London townships and Monroe city, causing fresh outbreaks in those places which resulted in an aggregate of 14 cases and 4 deaths; which, added to the 19 cases and one death which occurred at Azalia, make a total of 33 cases of sickness and five deaths from small-pox which are fairly attributable to the visit of the Heath boy who, while infected, was permitted to leave Howell.

The history of this outbreak affords further confirmation of the fact that mild forms of communicable diseases may impart contagium which may give rise to the most virulent types of those diseases; and emphasizes the often-repeated recommendation of this Board, that mild cases of those diseases should be treated, so far as restrictive and preventive measures are concerned, in precisely the same manner as cases of more virulent form.

After the committee visited Lansing, conferred with the Secretary of the State Board of Health as to methods, and were authorized by the Governor to enter thoroughly upon the work of restricting it, and were assured that the State would pay the necessary expenses, within a certain sum, there was no further spread of the small-pox in Azalia, nor from Azalia, not a single case occurred.

SMALL-POX OUTBREAK IN LONDON TOWNSHIP, MONROE COUNTY.

In this outbreak there were three cases, two of whom were exposed to the disease in Azalia, before it was known that the disease was small-pox, and, it was supposed, carried the contagium from that place. The first case, a child 6 to 8 years of age, was taken sick Jan. 10, 1889. The father of this child (he was exposed at Azalia) was taken down with the disease the same, or the next day. The third case was a lady who also had been exposed in Azalia.

Prompt, restrictive measures adopted by the local health officer and board of health, prevented further spread of the disease in this township.

SMALL-POX OUTBREAK IN MONROE CITY, MONROE COUNTY.

Of this outbreak, which resulted in three cases, one of which proved fatal, the local health officer, Dr. Charles T. Southworth, wrote to this Board, Feb. 16, 1889, as follows:

"In my report of this week, I report two new cases of small-pox. Let me say that they are the housekeeper and nurse of Father Peter Leary who died of malignant small-pox on the 29th inst., after exposure at Deerfield, while administering the last rites to some small-pox patient. Three persons have been confined in his house ever since. We had just about finished general free vaccination when the first case was reported. For some unknown reason the vaccination has worked very violently this year, to the extent of keeping persons in bed a week or longer, besides causing large ulcers on the arms instead of forming good scabs, and, in a great many cases we are having very hard work to save the arms and even the

patient. I myself have had several severe cases of blood poisoning. Our points were mostly from the Lancaster County farm, Pennsylvania; and from the Wisconsin farm." [What Wisconsin farm is not stated.]

In this outbreak there was no spread of the disease from the house where the first case appeared.

SMALL-POX OUTBREAK AT MUSKEGON CITY, MUSKEGON COUNTY.

In regard to this outbreak, during which there occurred 4 cases, the local health officer wrote to the Secretary of this Board, Nov. 24, 1889, as follows:

"I wish to inform you that the patient, Magnus Olsen, arrived at Muskegon the 14th inst., having come direct from Denver, Col., where he undoubtedly contracted the disease.

"The house has been quarantined and every precautionary measure taken to confine it to its present locality."

Later the same official wrote:

"How long do you consider it essential to keep a house quarantined, in which there is a patient who has had a very mild form of small-pox? The case is a mild one, described by authors as Febra variolosa sine exanthemate, occurring in the person of one of our physicians who was in attendance upon the original case, who came from Denver. His wife is in the same house with him, and also a nurse. He was taken sick the 8th inst., and the house quarantined the 11th. He now wants the quarantine raised as he claims he did not have small-pox. What do you consider the best way to disinfect? Do you consider it essential to burn bedding and clothes of a small-pox patient?"

In reply to the foregoing letter, the Secretary wrote, Dec. 21, 1889, as follows:

"The pamphlet which I send you herewith gives *full* particulars concerning the best methods of disinfection. However, the patient and attendants and premises should be isolated until the exfoliation has entirely ceased, and until everything used about the patient has been thoroughly disinfected. In the present instance, I would not advise the burning of the bedding, but it should be thoroughly spread out and thoroughly disinfected as well as everything in room and house, if usual conditions are there. Not less than three pounds of sulphur to every one thousand cubic feet of air space should be used."

SMALL-POX OUTBREAK AT ANN ARBOR, WASHTENAW COUNTY.

The following extracts from letters and reports, received from the health officer of the city, give the history of this outbreak, which resulted in four cases of the disease:

"Jan. 22, 1889. I send you report of case of small-pox. The only one known to our board in our jurisdiction, and I am confident the only one there is at this time.

"The patient is a pharmacy student who is believed to have contracted the disease at Lyons, N. Y., on his return from vacation about a fortnight ago. He was vaccinated the same day of the supposed exposure. The case is mild—varioloid—is doing well—was complicated by an erysipelatous inflammation of vaccinated arm. Patient and nurse in good quarters in hospital. All known exposed persons vaccinated, and clothing and rooms disinfected same night and next day, of report of case. And general vaccination being done in accordance with recommendations of Board of Health, published a week before we had any case. Will send you copy.

"I can't promise daily reports, but you can depend on all practical measures being taken to protect the public health.

"Jan. 27, 1889. Your letter of inquiry concerning small-pox here was received next mail after I had reported the case to you; and the package of pamphlets came next mail following, for which I am much obliged. I had some on hand, and had furnished to the postmaster at Azalia.

"Our one case of varioloid is getting on finely—has only a few pustules.

"The panic, which was extreme at first, is as rapidly subsiding, because no new cases have occurred,—though it is not time yet for fruits of any possible exposure from Daily.

"Should the bills for expenses incurred by a local Board in this case—and audited by the Board—be charged directly to the county, or to the city, and let it settle with the county?

"Also to what extent should the patient, if able, be called on to meet the expenses incurred in protecting the public health?"

"Feb. 6, 1889. I send you report of another case—varioloid. The patient had been quarantined, and on observation during the day. He is a member of the Alpha Delta Phi fraternity. Is quarantined in the fraternity house which is vacated by the other members.

"No connection between this and the former case can be traced. Patient had spent his vacation in Philadelphia, and probably was exposed there or on return, about three or four weeks ago. He was successfully vaccinated about ten days before the attack.

"Is there any State law requiring vaccination of persons before attendance at schools in this State?

"Every outbreak of small-pox in this city in past twenty-five years has come through students in University.

"Is it practicable to secure the passage of a law at this session of the Legislature requiring evidence of vaccination of every person admitted to any public institution of any kind in this State?

"I shall recommend to our Board at its next meeting to initiate such effort.

"Feb. 18, 1889. I enclose report of another outbreak of small-pox. The cases were only discovered yesterday and were immediately quarantined and all persons known or suspected to be exposed, disinfected and vaccinated. The exposures, however, have been among a class more difficult to learn about and to reach, than in the previous outbreaks, and, I fear there is more danger of the disease spreading from unknown infection, than in the former cases.

"The only source of infection that can be traced is, that the mother washed in the family of Mr. Wade, two weeks ago today (the day that the last case reported—Mr. Talley's—was reported to me, in the evening), washing the bed linen of the bed on which Mr. Talley had slept two nights before, along with the family washing.

"As neither Mr. Talley, Mr. Wade's family, the physician, nor the board of health knew of any infection until after the washing, it could not be foreseen nor prevented.

"It is a cause of much gratification that thus far no fruits have matured of exposures direct to his classmates and friends, by Mr. Talley, before it was known what his sickness was; and if happily we escape any outbreaks from those exposures * * * * I shall feel more confidence in the value of fumigation and disinfection, and that we have reason to congratulate ourselves, that the measures were thorough.

"Our first case—Daily—went home discharged on 9th. The nurse remained to hold the fort in our hospital,—disinfect and renovate. Just as he had got it cleaned so that it was safe for him to go out (though he was under contract to remain there nights) he was out about an hour Wednesday evening 13th, and when he returned his bed was on fire—evidently an incendiary attempt to burn the building."

"March 28, 1889. The last two of the four cases of small-pox reported to you—the Whitney children—completely recovered over two weeks ago, the house, inmates and contents thoroughly disinfected, quarantine raised and children now back in school.

"I believe I previously reported to you that the Alpha Delt. Fraternity were back in their house, the house having been thoroughly disinfected and renovated, the patient, Mr. Daily, at work again in college.

"The hospital secured for the first patient, Daily, was held and occupied by a nurse—for the Board—(after Daily's release and return to New York) in the event of being further needed until the 16th inst., when it was turned over to the owner. It had been thoroughly disinfected, cleansed, repainted and rekalsomined and all infected material not disinfected, destroyed.

"I have considerable faith in the effectiveness of disinfection when thoroughly practiced, and the community here join with us in the belief that our efforts were successful in restricting the outbreak."

As shown in the above extracts, the health officer of Ann Arbor, writing to this office, Jan. 22, 1889, asked the following questions:—

"Should the bills for expenses incurred by a local Board in this case--and audited by the Board—be charged directly to the county, or to the city, and let it settle with the county?

"Also, to what extent should the patient, if able, be called on to meet the expenses incurred in protecting the public health?"

In reply to these questions, the Secretary of this Board wrote to the health officer, Jan. 29, 1889, as follows:—

"Relative to payment by the city I send you herewith notices of different decisions of the Supreme Court, to which you are referred. They seem to show that the payment must primarily be made by the

city, but in the end must be paid by the county, in accordance with section 1647, Howell's Statutes. In reply to your question—'to what extent should the patient, if able, be called on to meet the expenses incurred in protecting the public health?' It would probably be for the locality to decide. However, the Supreme Court has decided that the Board of Supervisors cannot refuse payment on the ground that some taxpayers considered that the patient is himself able to pay."

SMALL-POX OUTBREAK IN YPSILANTI TOWNSHIP, WASHTENAW COUNTY.

The first intimation of the existence of small-pox in this locality was derived from the following letter received at this office, from A. R. Graves, Supervisor of the township, dated Feb. 16, 1889:—

"Will you please give me some information in regard to the following?

"When a distinction is made by the Board of Supervisors, between county and township poor and townships are required to care for their own poor, is the county liable for the expense of caring for a case of small-pox or other disease dangerous to the public health where the persons or their relatives are not able to pay the expense themselves, or is the township liable?

In reply to this letter the Secretary of this Board wrote to Mr. Graves, Feb. 18, 1889, as follows:-

"I am not a lawyer, and I do not know what effect the action of the Board of supervisors can have upon the general law, such as the one which requires the support of small-pox patients to be at the charge of the county. My impression is that the law means what it says, and that the county must pay. However, as you will see on page 15 of the document on the restriction of small-pox, which I send you to-day, the Supreme Court of this State has said (51st Mich., P. 527) that the city or township must make provision, and take immediate responsibility, looking to the county to pay the bills later.

"Probably you had best consult your prosecuting attorney, who should be willing and able to advise you on this point."

The Secretary of this Board wrote also to Frank K. Owen, M. D., health officer of Ypsilanti township, under date of Feb. 18, 1889, as follows:—

"Enclosed I send to you a letter concerning small-pox in your jurisdiction; no report of the presence of that disease in Ypsilanti township has been received from you, as the law would require if it were present, but I have received information, though not positive, which leads me to believe that you have a case of that disease.

"Alonzo E. Ford, clerk of the township, writes me that he has been instructed to ask me to send you instructions in regard to small-pox, and in regard to your powers and duties as health officer, which is done by the printed matter sent by this mail.

"I trust I shall receive full and prompt reports from you as the law requires; this office will render any aid in its power in suppressing or preventing an outbreak of small-pox in your jurisdiction."

Feb. 18, 1889, Dr. Owen reported that two cases of small-pox existed in the township; and on Feb. 26, 1889, he wrote in regard to those cases as follows:—

"The two cases of small-pox reported * * * * have fully recovered and there has been a thorough house cleaning and renovating.

"The bed consisted of rags, pieces of comforters, and husks and their clothes of rags and tatters. All the bedding and clothes have been burned, and they have been supplied with new clothes. The house has been renovated by burning sulphur, using chloride of lime, and washing the walls and ceiling with quick lime."

SMALL-POX OUTBREAK AT BERLIN, MONROE COUNTY.

In regard to this outbreak, J. J. Valade, M. D., health officer of Berlin township, telegraphed to this Board as follows:—

"June 13, 1889. One case of varioloid broke out in a gang of Italians [68] that came from Chicago two weeks ago. We have isolated the case, fumigated their clothing and cars with sulphur, given them a thorough carbolated bath. Must we keep them quarantined, or allow them to work? They are grading on railroad.

"June 21. No more cases have developed. But one or two scabs on sick man. Been quarantined two weeks. After being disinfected would you allow man to work Monday? Shall we destroy bedding or fumigate?"

In reply to this latter telegram, the Secretary of this Board wrote to Dr. Valade, June 21, as follows:—

"Dear Sir:— * * * * As the patient is liable to communicate the disease as long as the period of desquamation continues, he should be kept in isolation until the scabs (which contain the germs of the disease) have entirely disappeared, and after thorough disinfection.

"As to the bedding and clothing, it would be safest to have it burned. However, if it is too valuable to be destroyed, it should be disinfected as described on page 11 of the marked pamphlet which I send you by this mail (Prevention and restriction of small-pox.)

"We hope to receive a complete final report of this case as soon as the outbreak is over. Weekly reports have not been received. If any other cases occur this office should at once be notified. The period of incubation being sometimes longer than that during which this patient has been kept in isolation, those exposed should be still kept under observation."

In a final report made June 30, Dr. Valade thus describes the measures taken to restrict this outbreak:

"Built a temporary pest house half a mile from any house. Had watcher to purchase all their necessaries. vaccinated every one of them. The car which the case was in, was burned by R. R. Co., also pest house. Every one of them was given a carbolated bath."

SMALL-POX OUTBREAK IN CALVIN TOWNSHIP, CASS COUNTY.

In the outbreak reported from Calvin township which resulted in three cases, there seems to have been difference of opinion among the attending physicians as to the nature of the disease, some contending that it was chicken-pox, while others maintained that it was small-pox.

The following extracts from letters and reports received from the health officer of the township give detailed history of this outbreak:

"There has a disease broken out in my jurisdiction, Calvin township, said to be small-pox by the attending physician. I first saw the case Saturday. * * * * The first case noticed, Mina Darling, aged 8 years, taken sick Nov. 11, not very sick. Nursed by parties at whose house she was staying. Second case, Chauncey Smith, aged 45 years, taken sick Nov. 24, with violent rigors, had been indisposed a day or two; epigastric uneasiness, vomiting, high fever, pain in back, *marked* headache, delirium, sore throat and great debility. On third day an eruption appears, first on forehead and chin, extending to face and over entire body, to the number of hundreds; and I find characteristic eruptions, "sores" in mouth and fauces, also in eyes. The history of case, obtained by careful questioning of patient, is as above; and further that the sores first appeared as bright red spots, feeling like shot under the skin, small but elevated, growing larger, filling with clear fluid at points, then changing to pus; and when I saw the patient, the sores were distinct elevations, dark red, pus in center of each and umbilicated.

"The probable reason the case has not been reported to me sooner is the controversey over the diagnosis, doctors from C maintaining it is varicella, chicken-pox.

"Deeming it for the best interest of Calvin township and the community at large, I have placed placards on the front door and fence, with the words "small-pox" printed thereon. * * * * Parties who were in the house at the time, I have forbidden their leaving, or others entering, except nurse. By so doing, there is great feeling of resentment toward me by neighbors of the sick parties, and who are not inclined to obey my orders, as they continue to go there; claiming error of diagnosis. * * * * If I am in error in diagnosis I feel it far safer, for our township, to err on the safe side."

In this outbreak, the third case was in the person of a little boy, in the same house as the other two cases; and the outbreak was confined to the house where it originated.

In the foregoing instance, the health officer acted with commendable discretion, in taking all precautionary measures necessary to prevent the spread of the disease,—notwithstanding the variance of opinion in regard to its nature, deeming it much the wiser plan to err on the safe side if he

erred at all. If all health officials and physicians of the State were to adopt a like policy under similar circumstances, a great many cases of sickness and deaths from communicable diseases would be prevented.

ONE OF THE DANGERS TO PUBLIC HEALTH.

The following extracts from correspondence which passed between local health officials and this Board, during the year 1889, show one of the dangers to public health through lack of support of health work by boards of supervisors.

Dr. A. G. Mesic of Milan, Monroe county, wrote to this office, Oct. 24, 1889, as follows: —

"There was a part of my bill for treating small-pox, last winter and spring that came too late for the meeting of the Board of Supervisors, and we therefore waited patiently until October meeting, which was held last week, and they have taken no action upon it; also they have cut down a poor widow's bill that has been waiting the same length of time, which bill was upon contract as was also mine. Hers was allowed but cut from $2.00 per day to $1.50, and the woman has been lying sick and much in need of the money. She was a faithful nurse, and I think such work is shameful. Is there not some way whereby she can recover her rightful dues, without spending as much as it will come to? She, as well as myself, did her work faithfully for the public good. My bill amounts to something like $130.00 still due. I do not like to go to work and spend as much as it will come to, to get it, and I cannot afford to lose it. I am a poor man and did my work at a very reasonable rate, upon contract, supposing there would certainly be no trouble about the pay.

"Now if you can tell me how to proceed to get it with the least expense, I would be pleased to have you inform me.

"Excuse me for troubling you; but I thought you would be interested in seeing such bills paid, and thought perhaps you could give me some valuable advice, as you probably have had experiences of this character before.

"If I must spend all that it comes to, I should not wish to go into it. I have always kept out of law, and do not claim to know much about it. Please give me some advice and oblige."

In reply to the foregoing letter, the Secretary of this Board wrote to Dr. Mesic, Oct. 30, 1889, as follows:—

"In reply to your letter of Oct. 24, I agree with you that the action of the Board of Supervisors in cutting down a bill for suppression of a dangerous disease, is shameful; but I see no remedy except to secure a mandamus from the Supreme Court. The cost will probably depend upon what your lawyer charges. The county *ought* to be obliged to pay the cost of it."

VACCINATION.

During the various outbreaks of small-pox in Michigan in 1889, large numbers of pamphlets and leaflets on the restriction and prevention of small-pox were distributed by the State Board of Health; free vaccination seems to have been generally offered by local health officials in accordance with law, and accepted by the people of localities where the disease prevailed; and, not only is this true in regard to places where small-pox had actually appeared; but in others, whose proximity to infected localities, suggested the possibility of their ultimate infection. Many applications for vacine virus, and for information as to where reliable virus might be obtained, were received at this office; and the desired information was given.

During the correspondence which took place between local health officials and the Secretary of this Board on the subject of vaccination, there arose the question of compulsory vaccination.

COMPULSORY VACCINATION.

Extracts from the above-mentioned correspondence as to the advisability of making vaccination compulsory by a general law, are a follows:—

Dr. W. F. Breakey, health officer of the city of Ann Arbor, wrote to the Secretary of this Board Feb. 6, 1889, as follows:—

"Is there any State law requiring vaccination of persons before attendance at schools in this State?

"Every outbreak of small-pox in this city in past twenty-five years has come through students in University.

"Is it not practicable to secure the passage of a law at this session of the Legislature requiring evidence of vaccination of every person admitted to any public institution of any kind in this State?

"I shall recommend to our board at its next meeting to initiate such effort. Will it have better hope of success to go in form of recommendation from our board to State Board?

In reply to the above letter, the Secretary of this Board wrote to Dr. Breakey, Feb. 8, 1889:—

"In answer to your question as to whether there is a State law requiring the vaccination of all persons before attending schools in the State, I would say that there is not. But your local board of health could make such regulations and publish them (see marked pamphlet sent today), when they would have the force of law.

"In reply to your question, 'Is it not practicable to secure the passage of a law at this session of the legislature, requiring evidence of vaccination of every person admitted to any public institution of any kind in this State?'—Perhaps it may be, but how about the State Prison? I cannot judge any better than you can of the temper of the present legislature, as I have no opportunity to find out. You ask if the recommendation would have more effect coming from your board to our board. I do not know about that, but our board will not meet again until April when it would be too late to get a bill introduced. However, if such a recommendation is received by me it would probably be given out to the newspapers, and that might call attention to it".

Feb. 18, 1889, Dr. Breakey again wrote to this office as follows:

"Relative to the question of trying to secure a law requiring partial compulsory vaccination and your inquiry as to 'how about the State Prison?' I think that question, so far as the one at Jackson is concerned, is practically already answered. And I do not see why they are not the very institutions in which the law could be most easily enforced. It would be as easy to secure vaccination if needed as to secure cutting hair, a bath or the wearing of prison uniforms.

"One of the new Inspectors, Col. H. S. Dean of this city, on his first official visit to the Jackson Prison secured the adoption of a resolution by the Board requiring every prisoner thereafter admitted, to be vaccinated at once on his admission, and as rapidly as practicable, without disabling too many of the prisoners at once, to have the entire number vaccinated.

"As to the attempt to secure a State law, if it is possible there would be opposition, or what is equally fatal, apathy, or if it would require lobbying, and attendance of persons from a distance, or if there are no physicians or persons of sufficient intelligence in the legislature to appreciate or work for it, then I fear it is not very promising to expect it.

"Dr. Duffield, health officer of Detroit, favors the idea of a State law, though they require vaccination as a condition of admission to schools, and so can every city and township, but few of them will do it, if it is optional, until some local outbreak scares them. We shall secure it here for the schools of the city and the University I think; but I still think it would be better if we could have a State law."

In answer to this letter of Dr. Breakey's, the Secretary of this Board wrote to him, Feb. 19, 1889, as follows:—

"I agree with you as to the practicability of enforcing vaccination at the State Prison; and where the movement starts, as in this case, with one of the prison inspectors, it promises much. But, if it came only by the compulsion of a State law I should not expect much good to come from it. This principle applies throughout. I hope much from the local regulations, requiring vaccination as a requirement for admission to schools, but I would not care much for a general law requiring this. My belief is, that most progress can be made by favoring local self government, based on the intelligent convictions of those in authority, locally. I am thankful that we have no general law for compulsory vaccination in this State;

for, consequently, we have no "Anti-Vaccination Society" as they have in England. The experience in this State, since our Board was organized, seems to me to prove that our methods—by moral suasion—are a success, and I do not feel like throwing away the present useful methods.

"If all local boards, would, as yours has done, recommend general vaccination, and otherwise spread the information as to the importance of vaccination, I think we could make the greatest progress. After you have told a person who is not convinced of the importance of vaccination that he *must* be vaccinated anyway, he is no longer open to conviction of its desirability."

March 28, 1889, Dr. Breakey wrote to this office to the effect that a regulation of the board is now published, requiring vaccination, within the previous five years, of all pupils in schools, and of all students admitted to the University.

MEASLES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1889.

During the year ending December 31, 1889, there were reported to the office of the Secretary of the Michigan State Board of Health, 2,899 cases of sickness and 28 deaths from measles. These reports are for 148 local jurisdictions, showing an average of 19.6 cases per locality (township, city or village, as the case may be). There was one death to every 104 cases reported.

Of the source of contagium for the outbreaks of this disease, the health officers report in 36 instances that it was from other localities, 37 reported that they were unable to state how the disease originated, 57 say nothing about the source, and 18 give other sources.

Of the efforts made to restrict the disease, but little is said in the reports. A few seem to have made efforts at restriction, but generally nothing very effective was done.

TABLE 1.—*Measles in Michigan during the year 1889, exhibiting by months, the per cent of all weekly card-reports received which stated the presence of measles; the average per cent of all observers reporting weekly who reported measles; the average order of prevalence of measles where it was present; and the number of outbreaks reported by health officers and clerks of local boards of health.*

1889.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Per cent of weekly card reports	6	5	4	4	7	10	11	7	3	3	4	6	9
Average per cent of observers	12	11	9	8	13	21	18	14	7	7	8	13	16
Average order of prevalence where present	3.6	3.3	3.0	5.0	4.3	3.5	3.1	3.2	3.6	3.4	3.0	3.5	3.7
Prevalence *	7	7	6	11	9	2	1	4	10	8	6	5	3
Outbreaks †	148	13	7	10	10	9	11	7	3	9	13	17	17

* This line is a combination of the first and third lines of this table. The method of combining them is explained on pages 122-3 of this report. The smallest numbers indicate greatest prevalence.

† Twenty-two outbreaks were reported without dates, and are omitted in this statement of the number of outbreaks per month.

NOTE.—The facts in this table are from two distinct sources,—the first four lines contain statements derived from the weekly postal-card reports by physicians, the last line contains statements derived from official reports by health officers and clerks of local boards of health.

The above table exhibits the evidence of the weekly card-reports and of the special reports by health officers and clerks of local boards of health concerning the prevalence of measles during the year 1889, from which it appears probable that the maximum prevalence of the disease was reached in June, and the minimum in March.

In the Annual report of this Board for the year 1888, pages 264–267, a study of periodicity in the prevalence of measles was printed. In that article it was shown that measles exhibits a seven-year period in its prevalence, and it was predicted that a maximum period would be reached in the year 1888. A diagram has been prepared which graphically illustrates the facts then presented, and continues the curves to the years 1888 and 1889, confirming the statements in that article so far as relates to those years. The diagram is printed on page 197.

AGE OF PERSONS SICK WITH MEASLES.

Of the 436 cases of measles considered in the following table (and these were all of which the age of the patient was stated), 251 occurred before the tenth birthday was reached. In the first periods (those under ten years of age) the deaths were 1.6 per cent of the cases, which is 0.2 per cent above the average for all ages. In the cases among persons from ten to twenty years of age the per cent of deaths was also 0.2 above the average.

Sixty-three cases were reported as having occurred, during the year 1889, in persons after the twentieth birthday, with no deaths. There occurring no deaths in this number of cases at that age is probably an exception to the rule, and would not hold good in a very large number of cases at that age.

TABLE 2.—*Exhibiting, relative to 436 (all in which the ages were reported) cases of Measles in Michigan in 1889, the number of cases, and deaths, and the per cent which the deaths were of the cases in several periods of ages.*

	Reported cases and deaths within certain ages.						
	All ages.	Under 10 yrs.	10 to 20	20 to 30	30 to 40	40 to 50	50 and over.
Number of cases	436	251	122	44	13	3	3
Number of deaths	6	4	2	-------	-------	-------	-------
Per cent the deaths were of the cases	* 1.4	1.6	1.6	-------	-------	-------	-------

*The per cent which the deaths are of the cases, as here given, relates only to those cases for which the age of the patient was stated in the reports.

The following table exhibits the number of cases occurring in each of the first five years of age of the patient, and in each five-year period up to sixty-five years of age; also the average age for each period, and for all the periods, and the per cent of the whole number occurring in each five-year period.

In this table it may be seen that the greatest number of cases occurred between the fifth and tenth birthdays, and that only 2.5 per cent of all cases occurred after the thirty-fifth birthday.

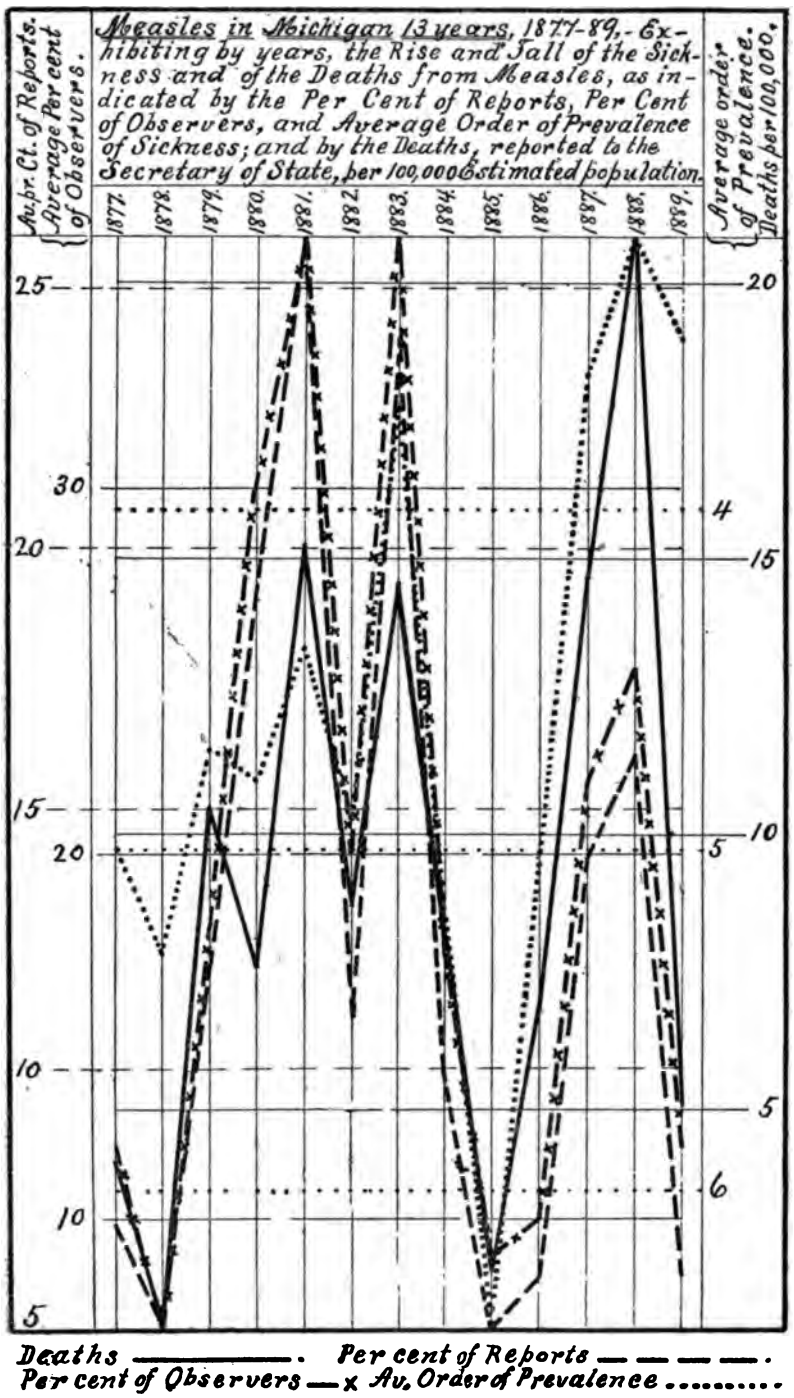

Measles in Michigan 13 years, 1877-89.- Exhibiting by years, the Rise and Fall of the Sickness and of the Deaths from Measles, as indicated by the Per Cent of Reports, Per Cent of Observers, and Average Order of Prevalence of Sickness; and by the Deaths, reported to the Secretary of State, per 100,000 Estimated population.
Av. pr. Ct. of Reports. Average Per cent of Observers.
Average order of Prevalence. Deaths per 100,000.
1877. 1878. 1879. 1880. 1881. 1882. 1883. 1884. 1885. 1886. 1887. 1888. 1889.
25 30 20 15 20 10 5
20 4 15 10 5 5 6
Deaths ———. Per cent of Reports — — — —.
Per cent of Observers —x Av. Order of Prevalence .....

TABLE 3.—*Exhibiting the number of cases of Measles occurring at stated ages and periods of age, and the ratio per cent of cases in each period to the total number of cases. (Compiled from those reports in which the age was stated,—not all reports did so.)*

	All cases.	Number, and per cent of cases in persons within certain periods of age.																	
		Under 1 year.	1 to 2	2 to 3	3 to 4	4 to 5	1 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 55	55 to 60	60 to 65
Number of cases.	436	12	22	22	19	23	98	153	78	44	27	17	8	5	3	0	0	1	2
Per cent of all cases in each period of age	100	....	....	....	....	....	22	35	18	10	6	4	2	1	1	0	0	0.2	0.5

AGES OF PERSONS WHO DIED OF MEASLES IN THE YEAR 1889.

Of the 28 deaths reported to have occurred from measles during the year, the ages of but six were stated. The following table exhibits the number of deaths which occurred in each of the first five years of age, and in periods of five years each after the fifth birthday. It will be noted that a greater number of deaths occurred during the first year of age, than in any other year; and as many as in any period of five years, except the first which included that age, and that over one-half of all the deaths were of persons under five years of age.

TABLE 4.—*Exhibiting the number of deaths from Measles occurring at stated ages, and periods of ages, and the per cent the deaths in each period were of the total number of deaths reported. Compiled from reports in which the age was stated.*

	All deaths.	Age—in periods of years.													
		Under 1 yr.	1 to 2	2 to 3	3 to 4	4 to 5	Under 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45
Number of deaths	6	2	0	0	0	1	3	1	2	....	....	....	....	....	....
Per cent of deaths in each period	100	....	....	....	....	....	50	17	33	....	....	....	....	....	....

TABLE 5.—*Exhibiting the average per cent of reports, and of observers, and the average order of prevalence of sickness from Measles in Michigan per month; also the reported deaths, during the 13 years and each of the 13 years 1877–1889; also the number of deaths per 100,000 of estimated population in each year of the same period.*

Years.	Annual average 13 yrs.	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889
Average per cent of reports *	13	7	5	12	19	26	11	24	10	5	6	14	16	6
Average per cent of observers *	20	12	7	18	30	37	20	37	17	9	10	22	25	12
Average order of prevalence *	4.7	5.0	5.3	4.7	4.8	4.4	4.9	3.7	5.2	6.4	5.0	3.6	3.2	3.5
Prevalence †	7	10	12	7	5	2	8	1	9	13	11	4	3	6
Deaths from measles ‡	170	62	16	167	125	256	150	258	144	38	129	285	414	104
Deaths per 100,000 of population ††	9.2	4.1	1.0	10.5	7.6	15.3	8.7	14.6	8.0	2.1	6.8	14.7	20.8	5.1

* The information on this line is obtained from the weekly postal-card reports to the State Board of Health by physicians in different parts of the State.

† This line is a combination of the first and third lines of this table. The method of combining them is explained on pages 122-3 of this report. The lowest numbers indicate greatest prevalence.

‡ According to the Vital Statistics of Michigan.

†† The estimated population for the years included in this table was as follows: 1877, 1,484,824; 1878, 1,533,573; 1879, 1,583,932; 1880, 1,636,937; 1881, 1,677,346; 1882, 1,718,761; 1883, 1,761,202; 1884, 1,804,699; 1885, 1,849,258; 1886, 1,894,928; 1887, 1,941,710; 1888, 1,989,653; 1889, 2,038,784.

MEASLES SHOULD BE RESTRICTED.

The reports from health officers and other officials, received at this office, in regard to measles, during the year 1889, show great neglect of householders and physicians, in whose houses and practice cases of measles occurred, in reporting those cases to the local health officials.

This neglect no doubt arose from the very prevalent, but fallacious idea, that because fewer deaths in proportion to the number of cases, occur in measles than in some other communicable diseases, efforts to restrict measles are unnecessary.

Measles is a communicable disease, which causes a great amount of sickness and many deaths annually in Michigan, and therefore the State Board of Health considers it a disease "dangerous to the public health." As such, the law provides that it should be restricted the same as other dangerous communicable diseases.

To show more fully the opinion of this Board in regard to measles, and why energetic measures for its restriction are advocated, the following is quoted from a paper on the prevention of dangerous diseases by the Hon. John Avery, M. D., president of this Board, which was read at the Owosso Sanitary Convention, November 23, 1887, and was printed in the annual report of this Board for 1888:

"Measles is another disease of which many children die annually in Michigan, and many others are made invalids through life from its effects. Under the belief that it is necessary to have this disease at some time, and that children are less liable to be severely sick with it than adults, little or no attempt is made to arrest its spread in a community, and it is allowed to take its own course. But where is the necessity for either adults or children having this disease? Children do not have it unless they are exposed to it; and there are many things a child had better catch than measles.

"Measles is neither necessary nor desirable. It brings anxiety and suffering. It means loss of time and money. It maims and kills our loved ones. Why not drive it from our midst, and save this suffering and loss of life, by keeping away from it and by keeping those who have it away from those who have not been exposed? Every case of measles comes from a preceding case. Its early symptoms are generally easily recognized. Its spread through a neigborhood is much more easily controlled than either diphtheria or scarlet fever. Its germs do not seem so tenacious of life. They are not so often carried in the clothing of protected persons, yet they may be and sometimes are so carried."

The following paragraph, quoted from a letter, received at this office from S. D. Yerington, M. D., health officer of Alma village, Gratiot county, also bears on this subject:

"We have measles during the last year, with one or two deaths from complications, and a number of coughs and weak eyes as sequelæ."

CAN MEASLES OCCUR IN THE SAME PERSON MORE THAN ONCE.

The above question is asked in the following letter, received from L. E. Haskin, M. D., health officer of Bowne township, Kent county.

"We have prevailing at this time a very general epidemic of a rash which is called scarlet rash by the health officer.

"We have a practitioner here who styles it measles, and by so doing has excited considerable alarm, and a call has been made on the Board to close the schools. Of nearly all the cases reported so far—perhaps forty—nearly every case has been such as has had measles, some of them only one year ago. The rash comes out the same day the indisposition is first noticed, and the patients in nearly every case are about, in school, or at work in two to four days. The rash resembles measles somewhat, and to settle the matter we have decided to abide by your answer to this question, viz.: Does measles occur in the same individual twice except in very rare cases?"

In reply to this letter the secretary of this Board wrote to Dr. Haskin, February 12, 1889, as follows:—

"There seems to be a consensus of opinion among the writers whose works are in the library of this Board, that measles rarely attacks the same person twice. Ziemsen in his Practice of Medicine says: 'Second attacks of measles are exceedingly rare, as much so as second attacks of varioloid, scarlet fever, varicella, etc.' But there are many instances where the disease has attacked the same person twice and even three times.

"The disease which you describe as being prevalent in your jurisdiction very much resembles rötheln (German measles), at least in the particulars which you mention."

DOUBTFUL ECONOMY.

The following letter from a health officer shows it to be very doubtful economy to neglect the adoption of precautionary measures in outbreaks of measles:—

"Two weeks ago I received the following communication from the council of the village. Their alleged object was to save expense. I would like your opinion as to whether they are standing on right and correct grounds:

"'At a regular meeting of the common council of the village * * * * clerk was instructed to notify you that you *need not* post notices of measles.'

"We have measles during the last year with one or two deaths from complications and a number of coughs and weak eyes as sequelæ."

A SUGGESTION RELATIVE TO SCHOOL CHILDREN.

The following extracts from letters received from Dr. F. A. Sellers, health officer of Meade township, Huron county, suggest the adoption of a precautionary measure for which circumstances seem to show a need:—

"April 2, 1889. Measles is in five families in this township. Had a meeting of the board of health yesterday—decided not to close the school—probability is that it will spread over the township, as many children were exposed before we knew it was in the neighborhood. * * * *

"April 9, 1889. We have a number of new cases of measles. Nothing serious. In making this report I am tempted to suggest a clause to be added to our State regulations, if not already there, viz.: That children who have visited distant localities, shall not re-enter a public school without a certificate from the health officer of the place visited, that no serious contagious disease exists there.

"The child who infected our district had been visiting in Ontario, near the small-pox district, and it was feared the disease was small-pox, which had it been the case, would have exposed 120 children to the disease, and good luck, not good management, was all that saved us."

BENEFIT OF COÖPERATION IN SANITARY WORK.

The following is an extract from a letter received from Dr. M. E. Whalen health officer of Paw Paw, Ban Buren county:—

"The village of Paw Paw has been quite free from any communicable disease during the past year. The people of the village and the health board have been harmonious in their work of keeping the town in as near a sanitary condition as we could well wish. In no instance has there been a demand made of any citizen that was not promptly complied with."

SCARLET FEVER IN MICHIGAN—YEAR ENDING DECEMBER 31, 1889.

During the year ending December 31, 1889, there were reported to the office of the secretary of the Michigan State Board of Health, 421 *outbreaks of scarlet fever in 382 localities. In these outbreaks there were reported to have occurred 3,535 cases and 166 deaths. The following map exhibits the number of outbreaks, cases and deaths from scarlet fever in each county in Michigan during the year ending December 31, 1889. From this it may be seen that of the 3,535 cases and 166 deaths in the whole State, 2,477 cases and 98 deaths were reported from the 28 counties comprising the four southern tiers of counties of the State. It may also be seen that from 10 of the 84 counties in the State there were reported 1,798 cases, or more than from all the remaining 74 counties. These ten counties, in the order of the greatest number of cases, are as follows:—Wayne county, 661 cases and 39 deaths; St. Joseph, 227 cases and 7 deaths; Kent, 199 cases and 6 deaths; Calhoun, 117 cases and no deaths; Otsego, 113 cases and 5 deaths; Washtenaw, 106 cases and 6 deaths; Shiawassee, 102 cases and no deaths; Bay, 98 cases and 5 deaths; Macomb, 88 cases and 2 deaths; Genesee, 87 cases and 1 death.

* It is sometimes difficult to decide whether cases in a given place constitute one outbreak or more than one. In connection with a table and diagram on following pages the number of outbreaks is stated differently, but a foot-note gives the reason why.

DISTRIBUTION OF SCARLET FEVER IN MICHIGAN IN 1889.



SCARLET FEVER IN MICHIGAN IN 1889 COMPARED WITH PREVIOUS YEARS.

TABLE 1.—*Exhibiting the Number of Outbreaks, Cases and Deaths from Scarlet Fever, together with the Average Number of Cases and Deaths per Outbreak, and the per cent of Fatal Cases, reported to the Office of the State Board of Health for each of the eight years, 1882—89.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Deaths per 100 Cases.
1882	.....	83	849	.....	138	.....	*16
1883†	164	150	1,802	11.	248	1.51	*14
1884‡	324	296	2,476	8.	230	.71	9
1885	356	337	2,750	8.	187	.53	7
1886	336	302	3,046	8.28	275	.71	9
1887	353	297	3,400	9.63	314	.89	9
1888	381	315	2,989	7.85	200	.52	6.7
1889	421	382	3,535	8.40	166	.39	4.6

* Probably in some instances only the fatal cases were reported.
† Use of the blank form "M" for weekly reports was begun in May, 1883.
‡ Use of the annual reports of health officers in compiling scarlet fever for the communicable disease article was begun in 1884.

In Table 2 is shown a comparison of the numbers of reported cases of sickness and deaths from scarlet fever in the year 1889, with the same for the year 1888, and the averages for the five years, 1884–8. It will be seen that there were reported 40 more outbreaks and 546 more cases in 1889 than in 1888, yet there were 34 deaths less in 1889 than in 1888. That more cases of scarlet fever were reported in 1889, than in 1888, is probably due to more perfect reports in 1889. The system of the State Board for obtaining reports is steadily improving from year to year, and it is believed that health officers, clerks of local boards of health and the people generally, are becoming more and more alive to the importance of thorough reports. The increase in the numbers reported is not so apparent in the deaths as in the cases,—less deaths were reported in 1889 than in 1888, and less in 1888 than in 1887. From the foregoing it may be inferred that the *fatal* cases were more likely to be reported than were the mild cases.

TABLE 2.—*Exhibiting the number of reported Outbreaks of Scarlet Fever in Michigan during the years 1888 and 1889, with the number of Localities in which it occurred, the number of Cases and Deaths, the average number of Cases and Deaths per Outbreak, Deaths per hundred Cases, in each year; with the departure of the same for 1889 from 1888, and from the average of the same for the five years, 1884–8.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Deaths per 100 Cases.
1888	381	315	2,989	7.85	200	52	6.7
Average for 5 years 1884–1888	360	309	2,932	8.20	241	67	8.2
1889	421	382	3,535	8.40	166	39	4.6
Departure of 1889 from 1888	+40	+67	+546	+55	—34	—13	—2.1
Departure of 1889 from the average for 5 years, 1884–8	+61	+73	+603	+20	—75	—28	—3.6

MEASURES TAKEN FOR THE RESTRICTION OF SCARLET FEVER.—RESULTS.

During the year ending December 31, 1889, while in some localities the outbreaks were confined to one family, many outbreaks were limited to two or three cases, and in eighty-four localities the outbreaks were limited to one case.

The following extracts from, or substance of, reports of health officers, show that they quite fully enforced isolation and thorough disinfection.

Dr. Leon A. Warsabo, health officer of the city of Coldwater, Branch county, in his special final report of an outbreak of scarlet fever in which one case occurred, reported substantially as follows, with reference to methods of restriction enforced:

The patient was isolated; four and one-half pounds of sulphur per thousand cubic feet of air-space were burned; contents of the privy disinfected, five pounds of chloride of lime and sulphate of copper being used; clothing and bedding were disinfected by washing in a "hot zinc solution;" discharges of the patient disinfected by sulphate of copper. After the outbreak was over, all clothing worn by the nurses and others exposed to infection, was disinfected by fumigation, and total destruction of a part of it.

George Greer, health officer of West Bloomfield, Oakland county, wrote of an outbreak at Orchard Lake, Michigan Military Academy, as follows:

"There have been but two cases of scarlet fever at the Academy, the patients in this outbreak were removed to an old house and kept until well, and then the premises were disinfected thoroughly. Four pounds of sulphur per thousand cubic feet of air space being burned, clothing and bedding exposed to infection, were disinfected by boiling and by fumes of sulphur."

Colonel J. Sumner Rogers, Superintendent of the Academy, sent the following circular letter to the parents of the cadets:

"DEAR SIR:—Another case of scarlet fever having developed in the school, and the disease being prevalent in Pontiac, we have deemed it wise to hasten our examinations, and allow all cadets who have completed their work to return to their homes.

"The case we have is a light one and in no way traceable to our first case. The cadet was promptly removed to one of the cottages near, so that our physician does not think that any of the cadets, with the possible exception of his room mate, Mr. Robbins, have been exposed, and he does not anticipate any further trouble. But as the year's work is about completed, we thought best to adopt this precautionary measure. I should not favor this action were it not for the prevalence of the disease in Pontiac, where they have been obliged to close some of their schools, and to which our cases are, we think, traceable. I trust that you will approve of our action in this matter."

Dr. A. E. Anderson, health officer of the city of Iron Mountain, Menominee county, reported concerning an outbreak in his jurisdiction as follows:

"The patient was isolated; three pounds of sulphur per thousand cubic feet of air-space was burned; the contents of the privy disinfected with a couple of pounds of chloride of lime, discharges of the patient disinfected by solution of corrosive sublimate, clothing and bedding were disinfected by being exposed to burning sulphur."

Dr. J. M. Waldron, health officer of the village of Schoolcraft, Kalamazoo county, reported concerning twelve cases and five deaths, occurring April 25–June 1:

"The parents were directed to stay at home, and placards placed on houses; since all the children in three families were sick, no isolation farther could be done. After the outbreak was over, the houses were disinfected by burning three pounds of sulphur per thousand cubic feet of air-space; the privies were not used, but discharges were disinfected and buried; clothing and bedding were disinfected by hot zinc solution; no public funerals were allowed; the bodies were wrapped in a sheet wet with a zinc solution of double the strength as stated in paragraph 17, of phamphlet."

Dr. G. L. Loop, health officer of the city of Bessemer, Gogebic county, reported concerning scarlet fever in that city in the month of November, 1889:

"The health board of city and township give me absolute power to act in all cases and you can rest assured that all that can be done to stop the spread of disease in my jurisdiction is promptly done without consultation with any one of the members of the board, who approve of all I do in the matter."

VIOLATION OF THE PUBLIC-HEALTH LAWS.

The following extracts from letters, etc., received at this office illustrate how the health laws are sometimes violated, and disease thus allowed to spread.

Dr. James A. King, health officer of Manistee city, reported:

"The case, a mild one, was under the care of Dr. McPherson, but I called three times; at every visit I found one or more women there, neighbors, with babes in their arms. I gave them a good scolding, and drove them out every time, but have no doubt they came back, and brought along a friend and her child, as soon as my back was turned. You cannot reach the adults, they are too ignorant to read, and too bigoted to look on any disease as anything but a visitation of providence, to be encouraged rather than prevented."

The success attending cautionary measures will not be complete until all the people are educated to see the necessity of coöperating with the health authorities, until all the people see the necessity of isolating every person sick with scarlet fever, and then, after death or recovery, of thoroughly disinfecting all articles likely to be infected, so as to destroy the germs of disease lingering in the house. The most important means, toward giving the people generally the necessary information, is the distribution, to the neighbors of the family in which the dangerous communicable disease is, of the pamphlets issued by the State Board of Health, giving, briefly, the facts relative to the restriction of the disease which is present in the vicinity.

Dr. S. A. St. Amour, health officer of Cheboygan city, reported:

"Thirty-five cases and two deaths in my jurisdiction, no disinfection, but few were isolated. No physician but one reported their cases, that physician and I were not to placard and isolate our cases, and let other cases not reported go unplacarded, if this had been done it would have brought hard feelings."

Dr. C. F. Cochran, health officer of West Branch, Ogemaw county, reported as follows:

"I give notice of another case of scarlet fever. I put up a notice, the householder tore it down. Today I took a physician with me (who was not treating the case, neither am I), and he diagnosed the disease the same as I had. I started to put up another notice, he again prevented me from doing so. The physician attending the case did not report to me; he calls it scarlet rash or scarlatina, and says they are not identical."

Any person who, in any way, violates the orders of the health officer is liable to a fine, and to imprisonment in the county jail if the fine is not paid.

One health officer reported as follows:

"In no way used any means of disinfection, the patient was not isolated from the rest of the family, although there were two more children neither of them took the disease, although it was clearly a mild case of scarlet fever, it did not spread in a single instance."

The following paragraphs are from a letter by Dr. H. M. Gale, health officer of Bay City, in the *Evening Press* and *Advocate*, Bay City, Monday, July 29, 1889:

"In the first place would state that the board of health was satisfied that the case complained of was a genuine case of scarlet fever, and that it was so considered by the attending physician, who willfully and carelessly neglected to send a proper notice to the sanitary officer. * * * *

"Since the decease of this child of Mrs. Trombley, scarlet fever has broken out in two adjoining houses which have been directly traced from this family, and due to lack of proper steps having been taken for the prevention of the spread of this disease. Thus through neglect on the part of this physician numerous families have been exposed to contagion."

PRACTICAL RESULTS IN RESTRICTING SCARLET FEVER.

In the compilation of the reports for Table 3, showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed, "Isolation or Disinfection or both Neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and Disinfection Enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or they lack that perspicuity which will enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or Disinfection or both not mentioned, or statements doubtful."

It is evident from the following table (3) and diagram, that a great saving of health and life to the people of Michigan is being accomplished by those health officers who are striving to obey the laws, and to restrict this disease, and it is hoped that the perusal of this report will stimulate others to follow their example and assist in restricting and preventing this and other communicable diseases.

The following table* (3) differs somewhat from the tables to be found in the Annual Reports of this board for the two years 1887–8, in this: that an effort has been made in the present and in the last preceding compilation to show the results of restriction when only one mode (either isolation or disinfection) was practiced, and when both were neglected. The first, second, eighth and ninth columns are compiled on the same principle as those in the tables in the reports for the preceding two years. The numbers of outbreaks that can be used in the third, fourth, fifth and sixth columns in this table are comparatively small.

In the Tables 3 and 4, and in the diagram which follows them, are exhibited the results obtained by health officers in Michigan in the restriction of scarlet fever by isolation and disinfection, and the comparison of these results with those obtained when one or both of these measures were neglected. From Table 4 it may be seen that during the four years ending

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*Whenever a break of 60 days or more has occurred in the progress of scarlet fever it has hitherto been regarded as two different outbreaks, but in estimating outbreaks for this table and the corresponding table for diphtheria, if the second appearance of the disease originated from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the *year*; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks*, even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

December 31, 1889, there were reported to the office of the State Board of Health 1,380 outbreaks of scarlet fever, with 8,258 cases of sickness and 476 deaths. Had isolation and disinfection been enforced in each of these 1,380 outbreaks, and the average remained the same as in the 210 outbreaks in which they were enforced, the number of cases of sickness would have been reduced to 3,436 and the deaths to 234. From this it will be seen that there occurred 4,822 cases of sickness and 242 deaths through neglect to properly isolate and disinfect. Further, it may be seen that had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column "Isolation or Disinfection or both Neglected," there would have occurred 17,347 cases of sickness and 938 deaths from scarlet fever, during the four years 1886-9. If we deduct the number of cases of sickness (8,258) and deaths (476) that *did* occur, we have 9,089 cases of sickness and 462 deaths that were prevented during the four years, 1886-9, by the measures of isolation and disinfection recommended by the State Board of Health.

To those health officers who were faithful in their efforts at restriction, these results must afford great satisfaction; to those who were negligent of duty, they should be a powerful incentive to increased diligence. It must not however be understood that in the outbreaks in which isolation or disinfection was neglected, the neglect was necessarily through any fault of the health officer; more frequently it was through the fault of the householder, possibly in a few instances of the physician who did not report the case to the health officer.

For the five years, 1869-73, the average number of reported deaths per year from scarlet fever in Michigan, according to the Registration Reports published by the Secretary of State, was 589, or 4.85 deaths per 10,000 estimated average population. The Michigan State Board of Health was organized in 1873. For the next 12 years, 1874-85, the average number of reported deaths per year was 425 or 2.61 per 10,000 estimated average population for those years, or 4,376 less deaths from scarlet fever, than would have occurred had the average remained the same as it was for the five years, 1869-73, before the board was established.*

* The average deaths per year from scarlet fever per 10,000 estimated population in the State of Massachusetts, for the twelve years 1874-85, is stated as 4.43. (46 Registration Report, Mass., 1887.) The State Board of Health of Massachusetts was established in 1869; but it has not until recently pursued the same methods as those which have been so successful in Michigan. That scarlet fever is recently being restricted in Massachusetts is made apparent in the vital statistics of that State; during the four years, 1886-9, the deaths from scarlet fever in Massachusetts were only 1.99 per 10,000 inhabitants (page 361, Reg. Report of Mass., 1889).

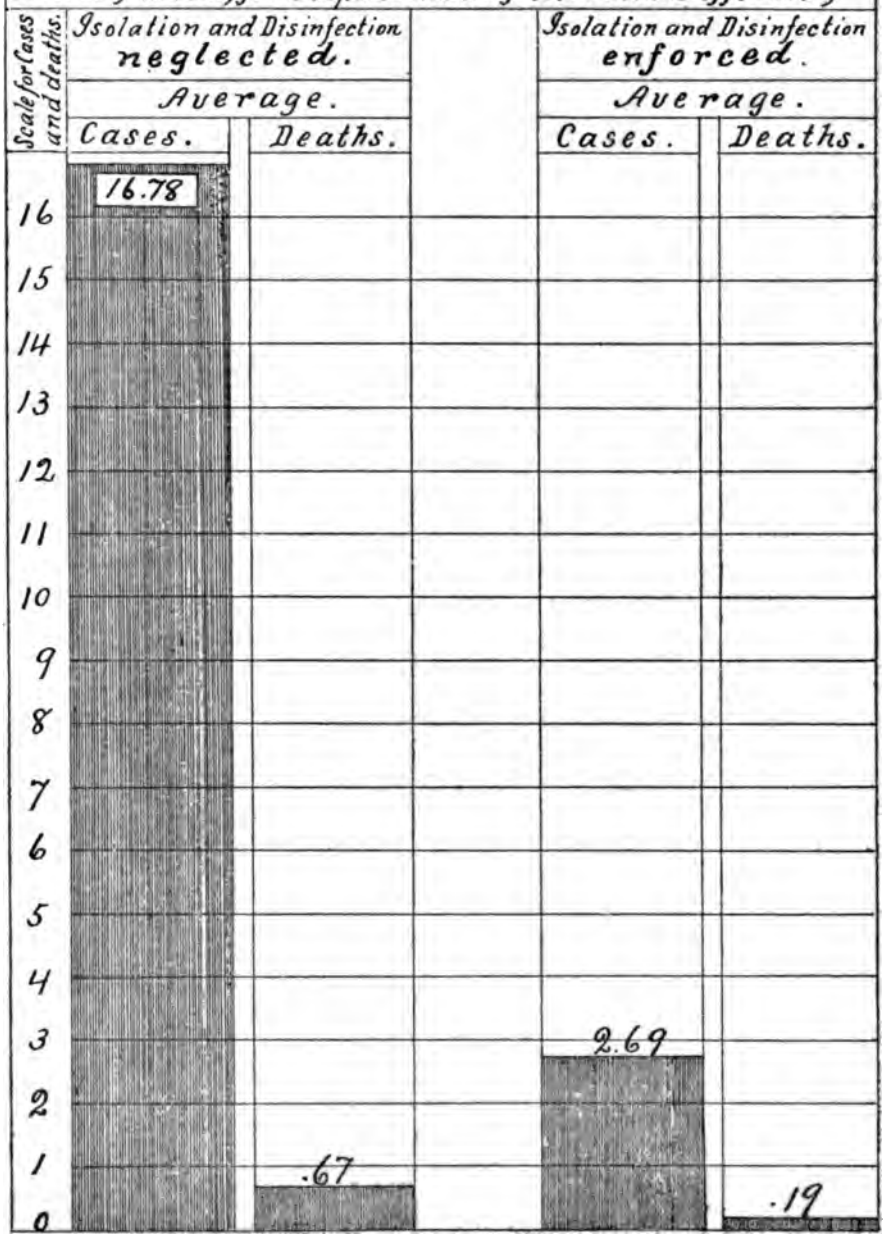
TABLE 3.—*Scarlet Fever in Michigan in 1889, Exhibiting the Average Number of Cases and Deaths per outbreak:—(1) in all the 417 outbreaks reported, (2) in the 284 outbreaks in which it is doubtful whether or not Disinfection or Isolation was secured, (3) in the eight outbreaks in which Isolation was neglected, and Disinfection was enforced or doubtful, (4) in the 7 outbreaks in which Disinfection was neglected, and Isolation was enforced or doubtful, (5) in the 7 outbreaks in which Isolation was enforced, and Disinfection was neglected or doubtful, (6) in the 3 outbreaks in which Disinfection was enforced and Isolation was neglected or doubtful, (7) in the 72 outbreaks in which both Isolation and Disinfection were neglected, (8) in the 52 outbreaks in which both Isolation and Disinfection were enforced, and (9) in the 87 outbreaks in which Isolation or Disinfection or both were neglected.*

	(1) All Outbreaks.* (417 outbreaks.)		(2) Isolation or Disinfection or both not mentioned or statements doubtful. (284 outbreaks.)		(3) Isolation Neglected, Disinfection enforced or doubtful. (8 outbreaks.)		(4) Disinfection Neglected, Isolation enforced, or doubtful. (7 outbreaks.)		(5) Isolation Enforced, Disinfection neglected or doubtful. (7 outbreaks.)		(6) Disinfection Enforced, Isolation neglected or doubtful. (3 outbreaks.)		(7) Isolation and Disinfection both neglected. (72 outbreaks.)		(8) Isolation and Disinfection both Enforced. (52 outbreaks.)		(9) Isolation or Disinfection or both Neglected. (87 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	2,822	123	1,453	61	55	5	27	1	20	0	13	2	1,208	48	140	10	1,290	54
Averages	6.77	.29	5.12	.21	6.88	.63	3.86	.14	2.86	0	4.33	.66	16.78	.67	2.69	.19	14.83	.62

* These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all of the time.

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet Fever in Michigan in 1889:- Exhibiting the average numbers of cases and deaths per outbreak:- in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



RESTRICTION OF SCARLET FEVER IN MICHIGAN.

TABLE 4.—*Exhibiting for the four years, and for each of the four years, 1886-9, the numbers of Reported Outbreaks, Cases and Deaths; also, for this four-year period, the Average numbers of Cases and Deaths per Outbreak, in all Outbreaks; in those outbreaks in which Isolation or Disinfection or both were doubtful; Isolation or Disinfection neglected; Isolation and Disinfection both neglected; Isolation and disinfection both enforced; and, also, the numbers of Cases and Deaths indicated as having been prevented by Isolation and Disinfection.*

Years.	All Outbreaks. *			Isolation or Disinfection or both not mentioned or Statements Doubtful.			Isolation or Disinfection or both neglected.			Isolation *and* Disinfection both Neglected.			Isolation and disinfection both Enforced.			Cases and Deaths Indicated as having been prevented by Isolation and Disinfect'n	
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Cases.	Deaths.
1886	324	1,716	100	221	934	43	45	623	46	†	†	†	58	159	11	‡ 2,768	‡ 230
1887	299	1,882	141	190	1,200	93	45	534	37	32	440	34	64	148	11	§ 2,835	§ 221
1888	340	1,838	112	225	955	74	33	819	39	61	724	33	36	80	3	§ 2,196	§ 72
1889	417	2,822	123	284	1,453	61	87	1,290	54	72	1,208	43	52	140	10	§ 4,175	§ 56
Totals	1,380	8,258	476	920	4,542	271	260	3,266	176	165	2,372	115	210	527	35	12,026	679
Averages, four Years	345	2,065	119	230	1,136	68	65	817	44	‖ 41	593	‖ 29	‖ 53	132	9	3,007	170
Av. Cases and Deaths per Outbreak		5.99	.34		4.94	.30		12.57	.68		¶14.46	¶ .71		2.49	.17		

* Outbreaks in Detroit and Grand Rapids not included.
† Compilations for this column were first made in the year 1887.
‡ These results are obtained by multiplying the total number of outbreaks for the year by the average number of cases (13.84) or deaths (1.02) per outbreak, which is obtained from the column "Isolation *or* Disinfection Neglected," and deducting from the results thus obtained the number of cases and deaths which *did* occur in the year 1886.
§ These results are obtained in the same manner as noted in the last foot-note above, except that the averages by which the whole number of outbreaks for each year is multiplied, are obtained from the column "Isolation *and* Disinfection both Neglected."
‖ Average for three years, 1887-9.
¶ Averages, cases and deaths, per outbreak for the three years, 1887-9.

SEQUELÆ OF SCARLET FEVER.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes, and also on account of the permanent injuries which result from it, thus: 350 pupils in the Michigan State School for the Deaf at Flint, during the years 1889–90, who became deaf since their birth, the loss of hearing of 39, or 11 per cent, is attributed to scarlet fever.* Of the 103 pupils in the Michigan State School for the Blind, at Lansing, during the two years, 1888–89, who became blind since birth, 8 or 7.8 per cent lost their sight from the effects of scarlet fever.†

SOURCE OF CONTAGIUM OF SCARLET FEVER.

Of the 421 outbreaks of scarlet fever reported during the year 1889, as exhibited in the following table, the local health officers reported the source of contagium as follows:—Traced to a former case, 142; probably to a former case, 19; unsanitary conditions, 6; unknown 157; and for 120 outbreaks the source of contagium was not given. The sources of six outbreaks were traced to the city of Detroit, and of 17 to places outside of the State.

Reported Source of Contagium of Scarlet Fever in 1889.	Outbreaks.
Traced to a former case	142
Probably to a former case	19
Unsanitary conditions	6
Unknown (including "Sporadic" 7, "Spontaneous" 1)	157
Not reported	120
All outbreaks	421

* 19th Biennial Report of the Board of Trustees of the Michigan School for the Deaf.
† Fifth Biennial Report of the Board of Control of the Michigan School for the Blind.

SCARLET FEVER TRACED TO A FORMER CASE.

Below are given a few extracts from reports of local health officers who were able to trace the disease to a former case; with the name of the health officer and of his jurisdiction subjoined:

"Mrs. F. H. Smith, of Eastlake, called on a family at Grand Rapids, where two or more children were sick with scarlet fever. She is supposed to have contracted scarlet fever there."—*H. W. Carey, health officer Manistee township, Manistee county.*

"On March 28, there came to Decatur a tramp, suffering with scarlet fever; he was on the streets for some time before he made any application for health or was seen by a physician; he was then cared for in the village jail for a few hours until comfortable quarters were fitted up for him outside the village limits.

"There have been in all ten cases, they were all of a mild form except the first case which was very severe, and the only one that proved fatal."—*Dr. G. W. Mahoney, health officer Decatur village, Van Buren county.*

"Supposed to have been brought here from Ann Arbor."—*John H. Lemon, health officer Superior township, Washtenaw county.*

"Two children brought home from Flowerfield township, St. Joseph county, with the disease, and three

children exposed by friends from Kalamazoo visiting them when their child was covered with rash, others exposed to these; ten cases in all."—*James Nesbitt, health officer Prairie Rond, Kalamazoo county.*

"A child two years old was taken to Grand Rapids on a visit and was taken sick a short time after returning."—*Dr. O. A. Dean, health officer South Haven village, Van Buren county.*

"Brought from Battle Creek."—*M. S. Osgood, health officer Menton township, Cheboygan county.*

"Imported from Jonesville."—*Dr. W. H. Sawyer, health officer Hillsdale city, Hillsdale county.*

"Contact with child from Saginaw."—*Dr. D. C. Howell, health officer Baldwin township, Iosco county.*

"The family had been visiting at Morley, and were exposed to scarlet fever the week before they were taken sick.

"A sister of the family took home their washing and in eight days her family were taken sick."—*I. W. Badger, M. D., health officer of Big Rapids city, Mecosta county.*

"On the 14th [October, 1889] a man with his wife and little child, who said he came from Pewamo, or near Palo, to get away from the scarlet fever, took dinner at Mr. Reed's. Mr. Reed's people said the child's face was quite red, and I have reason to believe that it was a mild case of scarlet fever, from which the Reed children took the disease."—*W. P. Gamber, M. D., health officer of Day township, Montcalm county.*

"A visitor from New York State, in whose family or vicinity the disease was before leaving home."—*W. K. Moore, health officer Clay township, St. Clair county.*

"Think it was from the clothing of an emigrant from Denmark. He said there was scarlet fever on shipboard. The first case was in a house about thirty feet away from the Dane's house. Eleven cases in all."—*Dr. W. M. Woodworth, health officer Grayling township, Crawford county.*

TABLE 5.—*Exhibiting the Localities from which Scarlet Fever was Spread (according to the Official Reports), with the Number of Cases and Deaths, if Reported; the Secondary Localities into which the Disease was said to have been Introduced from the First (with Number of Cases and Deaths). Compiled from Reports by ninety-two Health Officers who were able to Trace the Source of Contagium to other Localities.*

First Localities from which Scarlet Fever Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Antrim County:			Grand Traverse County:		
Elk Rapids township	15	2	Whitewater township	9	0
Berrien County:			Berrien County:		
Benton Harbor village	*		Sodus township	8	0
Branch County:			Branch County:		
State Public School	20	0	Coldwater city	1	0
Calhoun County:			Calhoun County:		
Battle Creek city	75	0	Burlington township	12	0
			Van Buren County:		
			Paw Paw village	1	0
Albion township	*		Jackson County:		
			Concord township	4	0
			Cheboygan County:		
			Mentor township	1	0
Cheboygan County:			Otsego County:†		
Cheboygan city	35	2	Gaylord village	75	5
			Livingston township	33	0
			Presque Isle County:		
			Allis township	17	0
Clinton County:			Ionia County:		
St. Johns village	36	2	Pewamo village ‡	9	0
Delta County:			Schoolcraft County:		
Gladstone city	1	0	Manistique village	3	0
Eaton County:			Ingham County:		
Charlotte city	41	1	Lansing city	2	0
Grand Ledge village	7	0	Lansing township	1	0
Emmet County:			Emmet County:		
Center township	1	0	Bliss township	2	0
Genesee County:			Genesee County:		
Flint city	59	1	Genesee township	3	0
South Grand Blanc	*		Mundy township	3	0
Hillsdale County:			Hillsdale County:		
Jonesville village	20	0	Hillsdale city	7	5
Allen township	10	1	Fayette township	2	0
Hillsdale city	10	1	St. Joseph County:		
			Three Rivers village	2	0
Houghton County	*		Keweenaw County:		
			Allouez township	1	0
Huron County:			Huron County:		
Sand Beach village	12	0	Rubicon township	3	0
Ingham County:			Ingham County:		
Lansing city	23	4	Ingham township	3	1

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

† From Gaylord village to Montmorency county, Briley township.

‡ From Pewamo village to Montcalm county, Day township.

TABLE 5.—CONTINUED.

First localities from which Scarlet Fever Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Ingham County:			Eaton County:		
Leslie township	1	0	Charlotte city §	41	1
White Oak township	6	0	Jackson County: Tompkins township	4	0
Ionia County:			Montcalm County:		
Pewamo village	9	0	Day township	2	0
Portland village	1	0	Clinton County: Eagle township	1	0
Otisco township	2	0	Ionia County: Ronald township	4	0
Sebewa township	*		Danby township	3	0
Iosco County:			Iosco County:		
AuSable	*		Oscoda village	15	6
Oscoda township	*		Huron County: Sand Beach Village ‖	12	0
Isabella County:			Isabella County:		
Mt. Pleasant city	*		Union township	7	0
Jackson County:			Livingston County:		
Jackson city	*		Fowlerville village	1	0
Kalamazoo County:			Kalamazoo County:		
Kalamazoo township	*		Prairie Ronde township	3	1
Kalamazoo city	17	1	Allegan County: Monterey township	12	1
Kalkaska County:			Kalkaska County:		
Garfield township	*		Springfield township	3	1
Kent County:			Kent County:		
Caledonia village	5	0	Caledonia township	2	0
Grand Rapids city	180	6	Manistee County: Manistee township	1	0
			Van Buren County: South Haven village	12	0
			Muskegon County: Ravenna township	2	0
			Ottawa County: Spring Lake village	10	0
Lapeer County:			Lapeer County:		
Dryden village	1	0	Almont Village	4	0
Livingston County:			Shiawassee County:		
Deerfield township	1	0	Owosso city	45	0
Mecosta County:			Mecosta County:		
Morley village	17	0	Big Rapids city ¶	24	1
Big Rapids city	24	1	Ætna township	1	1
Chippewa Lake	*		Green township	9	0
			Green township	3	0
Adjoining township	*		Montcalm County: Winfield township	11	0

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

§ From Charlotte city to Ingham county, Lansing city.

‖ From Sand Beach village to Huron county, Rubicon township.

¶ From Big Rapids city to Mecosta county, Green township.

TABLE 5.—CONTINUED.

First Localities from which Scarlet Fever Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Montcalm County:			Montcalm County:		
Maple Valley township	4	0	Pierson township	4	0
Lakeview village	13	1	Greenville city	4	0
Montmorency County:			Montmorency County:		
Atlanta village	*		Montmorency township	1	1
			Wheatfield township	5	0
Muskegon County:			Muskegon County:		
Muskegon city	27	4	Laketon township	4	0
			Ravenna township	3	0
Oakland County:			Oakland County:		
Pontiac city	31	2	West Bloomfield township	3	0
Otsego County:			Montmorency County:		
Gaylord village	75	5	Briley township	11	1
Ogemaw County:			Ogemaw County:		
Ogemaw Springs	*		West Branch village	18	0
Saginaw County:			Iosco County:		
Saginaw	*		Baldwin township	13	1
			East Tawas village	50	1
Saginaw County	*		Huron County:		
			Winsor township	11	6
Saginaw County:			Hillsdale County:		
Saginaw City	8	0	Hillsdale township	2	0
St. Joseph County:			St. Joseph County:		
White Pigeon village	57	4	Three Rivers	7	0
Three Rivers village	7	0	White Pigeon village	57	4
			White Pigeon township	67	2
Flowerfield township	4	0	Kalamazoo County:		
			Prairie Ronde township	2	0
Tuscola County:			Tuscola County:		
Vassar village	1	0	Juniata township	4	0
Washtenaw County:			Washtenaw County:		
Freedom township	3	0	Bridgewater township	12	1
Ann Arbor	*		Superior township	16	0
Ypsilanti city	*		Ypsilanti township	3	1
			Oakland County:		
			Southfield township	3	0
			Macomb County:		
			Warren township	67	0
Wayne County:			Lake County:		
Detroit city	608	39	Chase township	2	2
			Wayne County:		
			Hamtramck township	3	0
			Livonia township	3	0
			Highland Park village	1	0
(OUTSIDE THE STATE).					
Canada			St. Clair County:		
			East China township	2	0

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

TABLE 5.—CONCLUDED.

First Localities from which Scarlet Fever Spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
			Allegan County: Clyde township	7	1
			Berrien County: Niles city	1	0
Chicago			Osceola County: Lincoln township	3	0
			Oakland County: Pontiac city	31	2
			Van Buren County: South Haven village	1	0
			Ingham County: Lansing city	1	0
Dakota			Crawford County: Grayling village	11	2
Denmark			Van Buren County: Lawrence village	6	0
Michigan City, Indiana			St. Joseph County: Constantine village	7	0
South Bend, Indiana			Van Buren County: Arlington township	2	0
Indiana			St. Joseph County: Sturgis township	3	0
Montana			St. Clair County: Clay township	2	0
New York State			Gratiot County: Arcada township	1	1
			Kent County: ** Caledonia village	1	0
Ohio			Lenawee County: Fairfield township	1	0
Hurley, Wisconsin			Menominee County: Iron Mountain city	1	0

** From Ohio to Caledonia village, thence to Caledonia township.

HOW SCARLET FEVER IS SPREAD.

Below are given extracts from letters received at this office, which illustrate some of the various ways in which scarlet fever is spread:

"With one exception there has been no evidence of the spread of the disease from one to the other family. A boy attending one of the ward schools was taken sick and was allowed to attend school two or three days after beginning to complain. Finally his father, being employed at the asylum, had Dr. Christian of that institution, call and see the child; he made several visits to him, but being undecided in his diagnosis, requested me to visit his patient with him. I pronounced the case scarlet fever. About this time seven scholars from this school, most of them sitiing near the boy just mentioned, were taken sick with scarlet fever. The teacher, a lady about forty years of age, also took the disease at this time. The boy, who seemed to be the center of contagium of these cases, lived in a house where a case occurred the year previous in another family, and was attended by a physician who promised me to see that thorough isolation and disinfection should be carried out.

"In only one family did more than one case occur. That family lost two children from the disease.

"With the exception of the cases of the school children just mentioned, I am unable to say what the origin of the contagium was. I am convinced that oftentimes the disease has been spread by Sunday school books. I have found children in three instances sick with scarlet fever reading books from the circulating library, but from the method of keeping the record of books read by classes I could not learn where those books had previously been."—*Mason W. Gray, M. D., health officer Pontiac city, Oakland county.*

"I have given a great deal of time in an effort to discover its source and as yet am unable to do so, but have found that one of our book-sellers has been in the habit of buying second-hand school books from a house in Chicago, who collect the same from all parts of the United States and send them out for the use of scholars in need of the same. I believe that our trouble comes from these books."—*Dr. O. Millard health officer of the city of Flint.*

"In 1883 a child died of scarlet fever in Au Sable, adjoining us, no disinfectants were used.

"In 1889, this same house went under extensive repairs in rebuilding, during these repairs one of the children took scarlet fever and from that case, cases have scattered until we got it here."—*J. V. White, M. D., health officer of Iosco village, Iosco county.*

"The patient is a mail agent between Chicago and Cleveland, and was probably exposed while on duty, or from infected mail matter."—*Dr. David G. Sharp, health officer of the village of Cassopolis, Cass county.*

"Probably from attending religious services at South Grand Blanc, where the disease was said to be raging."—*Dr. Chas. B. Pearson, health officer of Mundy township.*

"The patient's father visited the family about ten days before his sickness, coming from Ohio, probably carrying the germs on his clothing; the boy was not out and that is the only discoverable source of infection."—*Dr. S. D. Yerington, health officer of Arcada township, Gratiot county.*

"One of the patients, a little girl, had books to read borrowed from the family who had the suspicious sickness a year ago, and who have had a genuine case recently.

"A young man was assistant in a drug store; he could think of no possible source from which he took the disease, unless from a farm house seven miles from this city, in which there were at the time two virulent cases of scarlet fever.

"Another case, a young lady who had just come from Chicago.

"Another patient, a little boy five years old was taken by his parents to Bay City, and sickened a few days after returning; the parents believed he took the disease on the cars."—*Dr. Mason W. Gray, health officer of the city of Pontiac.*

"This outbreak seems to have arisen from clothing brought here from Michigan City, Indiana, about four months after the child had the disease. Patients were exposed while playing with a boy having these clothes on."—*Dr. Zell L. Baldwin, health officer of Lawrence township.*

"A boy had been at Hurley, Wisconsin, on a visit, and had been riding with an undertaker who took care of bodies of children that had died of scarlet fever. Was taken sick a few days after returning."—*Dr. A. E. Anderson, health officer of the city of Iron Mountain.*

"I believe this outbreak (seven cases and three deaths) to be connected with the previous one (on Sheridan and Saginaw streets in this city) in not fully obeying instructions given by me. She failed to disinfect a valise used."—*Dr. C. H. Brucker, health officer of the city of Lansing.*

From this valise the nurse's child took the disease. Other cases are believed to have come from that in the following way: Mrs. Fitzsimmons, who arranged the flowers at the house where the child died, took with her, her little girl, who contracted the disease and died. The brother of this little girl also contracted the disease and died.

Miss C., visiting her grand-parents in Ann Arbor, received a letter from a school-mate in Lansing, sick with the disease, and a few days thereafter was taken sick with scarlet fever.

LOCAL HEALTH OFFICER AIDED THROUGH ACTION AT OFFICE OF THE STATE BOARD, AND SCARLET FEVER THUS RESTRICTED.

Dr. D. J. Nichols, health officer of the village of three Rivers, St. Joseph county, on or about May 27, 1889, asked assistance from the office of the State Board of Health, to determine the character of a disease in his jurisdiction, where there was a difference of diagnosis between the health officer and an attending physician.

The secretary of the State Board of Health, immediately telegraphed to Dr. Wm. Mottram, of Kalamazoo, asking him to go to Three Rivers and

make a careful examination of the case, which he promptly did, and also made investigation into the history of the preceding cases in the same family, and reported as follows:

"This case, though mild in form, is, in my judgment, a distinct case of scarlet fever, and I so decide."

Dr. Nichols writes of this outbreak as follows:

"The case was reported to me by Dr. Wm. M. Ikeler, on April 23, in the family of Mr. J. C. Thoms, in the western portion of the town; it was in this case that Dr. Mottram visited us to decide. Dr. Ikeler and myself had decided the cases (two in number) to be scarlet fever, and established a strict quarantine; but under the advice of another practitioner the family became rebellious, and a child who was away from home was permitted to return, and contracted the disease, and neighboring child also. The visit of Dr. Mottram settled the matter, and there was no further spread of the disease from these cases."

VITALITY OF THE SCARLET FEVER CONTAGIUM.

As the vitality of the germs of grain can be preserved for years, so can the germs of scarlet fever if packed away and left undisturbed. The following extracts from reports received at the office of the State Board from local health officers and others, may be of interest in the study of the vitality of the contagium that produces scarlet fever:

"It was caused by unpacking a box of clothing which had been packed away ten years and had been used around a case of scarlet fever, and was not disinfected."—*Dr. J. O. Bates, health officer of Spring Lake village, Ottawa county.*

"First two cases were thought to be from contagion remaining in an old house after death of child several years ago."—*Dr. C. L. Chandler, health officer of the village of Richmond, Macomb county.*

"I cannot find with certainty the source of contagion but the house is an old tenement, and only occasionally occupied. I am informed that five or six years ago there were cases of scarlet fever in the house." *Dr. J. M. Rankin, health officer of Richland township, Kalamazoo county.*

The following from a local paper in Charlevoix county is an account of the possible vitality of the contagium of scarlet fever for a very long period of time:

"In 1846, a boy of eight years, the brother of the narrator's wife, was taken down with scarlet fever and died. One of the principal amusements of his illness had been looking over a large picture book. After his death this, with several other useful playthings, was packed away in a trunk. Twenty-six years later, in 1872, the sister-in-law of the editor took this trunk with her on a journey which she made to England, where he (the narrator) was then residing. The trunk was opened the second day after its arrival and the picture book was taken out and presented to the editor's two-year-old son. During the next fortnight the little fellow was attacked by scarlet fever. It was a wonder to the doctors who were called in consultation how the disease had been contracted, as there had been no scarlet fever in the town for years. At last it occurred to the editor that the picture book might have transmitted the disease, and the medical men in attendance, on being told the facts connected with it, agreed that it had retained the poison for twenty-six years, and communicated it to the child."—*Boyne Citizen, August 23, 1889.*

REPORTED PERIOD OF INCUBATION OF SCARLET FEVER.

The average period of incubation, as given in each of the following tables, is 7 days; which is about one day less than the averages shown in similar tables in the Annual Report of this Board for the year 1888.

TABLE 6.—*Exhibiting the Reported Period of Incubation, in Days, for Scarlet Fever, in thirty-one instances. Compiled from reports of Health Officers, received in the year 1889.*

	Period of Incubation.										
Period stated in days	2	3	4	5	6	7	8	9	10	13	14
Number of instances in each period	1	1*	5†	8‡	3	7§	5	2	3**	1	1

* In this case it was reported as "about three days."
† In one of these cases it was reported as "about four days."
‡ In two of these cases it was reported as "about five days."
§ In three of these cases it was reported as "about seven days."
** In one of these cases it was reported as "about ten days."

The average length of the period of incubation, for the 31 instances, is 7 days.

TABLE 7.—*Exhibiting relative to thirteen instances of Scarlet Fever in Michigan in 1889, the Reported Period of Incubation within certain limits, stated in days; also the Means, the average of which may represent the average Period of Incubation.*

Days (in four instances).	Means.	Days (in five instances).	Means.	Days (in four instances).	Means.
1 to 7	4.	3 to 8	5.5	5 to 14	9.5
2 to 3	2.5	4 to 6	5.	6 to 14	10.
3 to 4	3.5	4 to 6	5.	9 to 18	13.5
3 to 7	5.	5 to 9	7.	10 to 12	11.
		5 to 10	7.5		

The average of the means in the above mentioned thirteen instances is 7 days.

LENGTH OF TIME SCARLET FEVER PATIENTS SHOULD REMAIN ISOLATED.

Notwithstanding the subject is treated of in the pamphlet [110.] issued by the State Board of Health, letters of inquiry are often received at this office, regarding the length of time a scarlet fever patient should be isolated, or the premises placarded. The following is an instance:

"I write for information regarding length of time a house is to remain placarded after recovery of a mild outbreak or case of scarlet fever." Dr. S. W. Barkwell, health officer of Dearborn township, Wayne county.

The placard should remain so long as there is, in the premises, contagium which may communicate the disease.

As mentioned in the pamphlet [110.], persons recovering from scarlet fever should not be liberated so long as any scaling or peeling of the skin continues, which sometimes is not completed before the lapse of seventy or eighty days. After recovery from scarlet fever, no person should appear in public wearing the same clothing worn while sick with or recovering from this disease, except such clothing has been thoroughly disinfected, and this without regard to time which has elapsed since recovery.

The following is a proposed form:

HEALTH OFFICER'S CERTIFICATE OF FREEDOM FROM LIABILITY TO COMMUNICATE SCARLET FEVER.

I hereby certify that_____has
(Name.)
entirely recovered from scarlet fever, the date of recovery being_____, 189__; that disinfection of the premises, where the disease has been, occurred_____, 189__; that the period of desquamation ceased_____, 189__; and that, after the peeling and scaling of the skin had ceased, the patient's clothing has been disinfected, _____namely, on_____, 189__; and that __he is now free from liability to communicate scarlet fever, and is at liberty to attend school, church and public assemblies.

_____

Health officer of the_____of_____.
(Township, city or village.)

_____, Mich., _____, 189__.

TYPHOID FEVER IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1889.

There were reported to the office of the secretary of the Michigan State Board of Health, during the year 1889, 2,530 cases of sickness, and 402 deaths from typhoid fever, in 398 localities. No reports of this disease were received from the following nine counties: Alger, Alpena, Benzie, Chippewa, Crawford, Isle Royal, Mackinac, Manitou and Montmorency.

The following table gives, relative to typhoid fever, the number of outbreaks, localities, cases, and deaths, average number of cases per outbreak, average number of deaths per outbreak, per cent ratio of deaths to cases, and the number of special final reports received, for the six years, 1884-9:

TABLE 1—TYPHOID FEVER.—*Exhibiting the number of Outbreaks, Localities, Cases, and Deaths reported for each of the six years, 1884-9; also for some of those years, the average Cases and Deaths per Outbreak, the per cent ratio of Deaths to Cases, and the number of Special Final reports received.*

Year.	Outbreaks Reported.	Localities Reported.	Cases Reported.	Deaths Reported.	Average Cases per Outbreak.	Average Deaths per Outbreak.	Deaths per 100 Cases.	Final Reports Received.
1884	----------	245	969	290	----------	----------	27	----------
1885	318	200	715	194	2.28	.89	28	----------
1886	290	282	1,194	282	4.15	.75	18	60
1887	335	320	3,424	411	*7.24	*1.23	17	46
1888	316	296	1,511	310	4.78	.98	21	60
1889	432	398	2,530	402	†5.17	†.93	†18	115

* The large average number of cases and deaths per outbreak in 1887 is partially accounted for by the fact that in two outbreaks the disease became epidemic, resulting in an aggregate of 535 cases and 73 deaths.

† In computing the average numbers of cases and deaths per outbreak, and the per cent ratio of deaths to cases in 1889, the outbreak at Negaunee, in which 300 cases were reported, is omitted, because the number of deaths which occurred in that outbreak was not reported.

As shown in the above table there were reported to this office 1,019 cases and 92 deaths more for the year 1889 than for the preceding year. The average number of cases per outbreak for the year 1889 is slightly more than for 1888. This is explained in part by the fact that, during the year 1888, there occurred no serious epidemics of this disease, whereas, during the year 1889 there occurred one such epidemic--at Negaunee, with 300 cases.

The reports received at this office show this disease to have been slightly less fatal during the present year than for the preceding year, the number of fatal cases being 3 per cent (of the total number of cases) less in 1889 than in 1888.

The large increase in the reported numbers of cases of sickness and deaths from typhoid fever in 1889 does not necessarily indicate that the disease was more prevalent in the State during that year than in previous years, when the numbers of reported cases and deaths were less. The apparent increase of sickness and deaths is no doubt attributable in part to increase of population and in part to more complete reports to and by local health officers.

Study of the regular sickness-statistics in Michigan (conclusions from which, are given in Exhibit 1 and Table 7, further on in this article) shows that, notwithstanding the large increase in the number of cases of this disease reported in 1889 by this system of communicable disease reports, on which the first part of this article is based, there was no actual increase in the prevalence of typhoid fever in Michigan in that year over the preceding year. The per cent of the weekly card reports which stated the presence of typhoid fever was the same in 1889 as in 1888 and in 1887.

SOURCE OF CONTAGIUM OF TYPHOID FEVER.

The following table gives the number of reports for each source of typhoid fever as reported by the local health officers. Casting aside those reported as coming from "outside of jurisdiction," "unknown" and those in which nothing was said about source of contagium, we find that in 56 per cent of the others the source of infection was attributed to the use of infected or bad water, and in 14 per cent it was *supposed* to be bad water.

TABLE 2.—*Exhibiting the reported "Source of Contagium" of Typhoid Fever in Michigan, during the year 1889.*

Reported Source of Contagium.	Number of Reports for each Source of Contagium.
Infected and impure water	57
Supposed to be impure water	14
Unsanitary surroundings	5
Low water in wells	10
Defective drainage and sewers	2
From a former case	4
From outside jurisdiction whence reported	56
Kissing a sister who was sick with the disease	1
"Cleaning out a well"	1
Decaying vegetables in cellar	3
"Long and continued drouth"	1
Care of brother having the disease	1
Filthy hog pen	1
"Digging up streets"	1
Unknown, (including "sporadic," 2; "catching cold," 2; "kidney trouble," 1; overwork, 2)	121
No source stated	154

Below are given extracts from statements found in the reports of local health officers with regard to the source of the contagium of typhoid fever.

Of the source of contagium in an outbreak which occurred in the township of Arlington, Van Buren county, the health officer, B. K. Howell, wrote as follows:

"My information leads me to believe that the direct cause of the outbreak was due to bad water and milk used in the family."

In the outbreak above referred to there occurred seven cases and one death, all in the same family.

Geo. W. Pifer, health officer of Long Lake township, Oscoda county, reports in regard to an outbreak of typhoid fever, which resulted in two cases, both of which proved fatal, that the first, a young man of twenty years old, contracted the disease while cleaning out an old well, and that the second case, his sister, became infected with the disease from kissing him on the mouth when he was at the point of death and was "purging" at the mouth.

Chas. Conklin, health officer of Leavitt township, Oceana county, who reported the source of contagium in an outbreak of typhoid fever as "impure water," wrote as follows:

"They used water from wells from 10 to 12 feet deep, and pumped dry each day. Pig pens and privies from 30 to 60 feet distant from wells."

Dr. William H. Budd, reporting an outbreak of typhoid fever, in Sidney township, Montcalm county, wrote in regard to the source of contagium as follows:

"On examination found as judged, that nothing round the premises could be questioned but the water. The man not having been away from home, but had been drooping some time prior to date. Thus my suspicions led me to have the water and the well examined. The result was, the finding of a frog and other things in a perfect state of putrescence, contaminating it to such an extent that the odor was terribly offensive. It was a dug well, depth some 24 feet, situated south of the kitchen door, say 12 feet. Round the sides was covered with fungous, slimy stuff—of filth if I may so designate it. This revelation established in my mind cause—and severity—of case. This poor man sipping hourly of this liquid to quench his fevered thirst necessarily aggravated the symptoms."

Dr. O. Millard, health officer of Flint, wrote in regard to an outbreak of the disease in that city:

"The five cases that I reported to you, with one death, I believe were the direct result of drinking water from the Flint City Water Works, filtered through one of the *toy* sand filters that screw on to a water cock. The matter came about in this way: During the very dry weather the Water Company were obliged to pump water from the river just below the mouths of the city sewerage. I at once called a meeting of the health board and we condemned the water for drinking, domestic or culinary use and published the resolution in all the city papers; and the Water Co. also published a standing warning to the effect that the water was not fit for any purpose except fires and closets, yet with all this the people (who were running a hotel) drank the water filtered through a few ounces of sand, and one died."

Dr. S. J. Hutchinson, health officer of Leelanaw township, Leelanaw county reports the source of contagium in an outbreak of typhoid fever which occurred in his jurisdiction as follows:

"Infection of drinking water, by unhygienic surroundings of privies, vaults and stables, on low ground. Also perhaps from saw dust accumulations * * * *. Spring and surface water were drunk during summer, where it prevailed, and without boiling."

Dr. W. M. Weller, health officer of the village of Ithaca, writes:

"Not positively known. A privy was within a hundred feet of both wells that the infected houses drew their water supply from, and a bad sink hole perhaps 8 rods from nearest well and 15 rods from farthest. Our town like most places of its size (2,000 population) is well undermined with privy vaults simply dug in the ground from 2 to 10 feet deep and from 1 to 15 years old. Our water supply is mostly drawn from shallow wells from 10 to 30 feet deep and of course there is no reason why we should not have plenty of typhoid fever. As health officer of the town I have repeatedly called the attention of the village Board to this fact; but they seem to think they are powerless to effect any change. Of course I shall do what I can; but just how to begin rather puzzles me at present."

Of an outbreak which occurred in Empire township, Leelanaw county, the health officer, Henry C. King, reports as follows:

"I think the source of the disease was a well 51 feet from *vault* and 150 feet from barnyard. Vault was used by a typhoid patient in July, 1888. Other cases from drinking water from barnyard drainage and slop refuse."

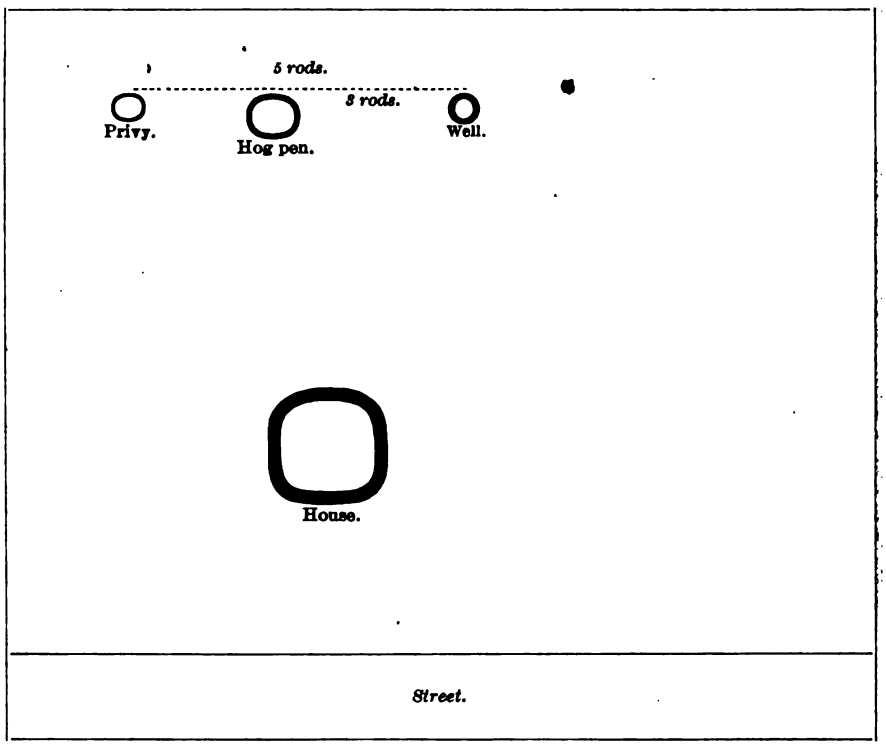
Dr. J. K. Niven of Ironwood, Gogebic county, in a final report in regard to an outbreak of typhoid fever which began May 24, 1889, and ended Jan. 24, 1890, and resulted in 115 cases and 12 deaths, gives as the source of contagium, "poor water supply and overcrowding of houses;" and further states that as a preventive measure, "closed up suspected wells and springs, and had the city employ a water carrier for two months;" and that "on one mining location where the wells were closed no new cases developed."

PROXIMITY OF WELL TO PRIVY AND HOG-PEN, CASES OF TYPHOID FEVER.

Sept. 5, 1889, Dr. J. D. Tripp, health officer of Franklin township, Lenawee county, who attributed an outbreak of typhoid fever to contaminated water, wrote:

"I was notified of a case of typhoid fever in a family by the name of H. His wife was taken sick Aug. 17, pregnant three months along, miscarriage 28th, died the 30th. Five years ago about this time, this man lost a girl 12 years old of this fever, then his wife, then two boys came down, in a few days himself. The last three recovered after a long time. You see this man lost two wives and a daughter all in the same house. I have no doubt of the cause. I have drawn a sketch of house, privy, hog pen and well. * * * The land descends towards the well; hog pen about three rods, privy five rods distant; bad water, not very clean in the house, I think is enough to make all this sickness."

The following diagram shows the relative positions of the house, privy, hog-pen and well, mentioned by Dr. Tripp



TYPHOID VIRUS SUPPOSED TO HAVE RETAINED ITS VITALITY FOUR YEARS.

Dr. W. A. Burnham, health officer of Greenland township, Ontonagon county, reporting the source of contagium in an outbreak of typhoid fever, writes:

"Four years ago there was a case of typhoid fever in the same house where this case was developed, and I think this case was contracted from some virus remaining about the premises."

Sept. 1, 1889, Dr. C. S. Lombard, of Negaunee, who has ever taken an active interest in the conservation of the public health of the city, wrote to the Secretary of the Board as follows:

"We have an epidemic of typhoid fever here—50 or more cases within the last three weeks. Are worked night and day. We have no health officer except *Mayor* and council, from the fact that no physician will accept of the position for the pittance paid. * * * Will you kindly send some one or come yourself and investigate?

"Am too busy to write further, we suspect our water supply but desire some one to come and make *sure*."

In reply to Dr. Lombard's letter the Secretary wrote to him Sept. 3, 1889, thanking him for his letter relative to the outbreak of typhoid fever in Negaunee, stating that a number of pamphlets on the restriction of that disease had been sent to municipal officers of the city, and that more would be sent if they could be placed where they would do good.

In reply the Secretary further wrote:

"I fear that it will not be practicable just at this time for a member of this Board to visit Negaunee. However I will see if it can be done. And some officer or person should send a sample of a gallon or more of water to Prof. V. C. Vaughan, Director of the State Laboratory of Hygiene, at the University, from some well used by typhoid patients; and great care should be taken that *all* drinking water is thoroughly boiled before being used.

"I should be very glad to receive from you a more complete account of this outbreak, and any aid which this office can give in restricting its spread will be gladly rendered."

On presentation of the foregoing facts to Dr. John Avery, President of this Board, by the Secretary, he (Dr. Avery) immediately went to Negaunee, and after his return wrote to the Secretary, Sept. 10, 1889, as follows:

"I returned from Negaunee yesterday, where I found some 75 to 80 cases of typhoid fever, pretty evenly distributed over the western three-fourths of the city. The sick are mostly miners and their families. The men work in seven or eight different mines; the water used at their homes is generally city water (from Lake Teal). A few take water from wells and all use water from the mines where they work. Samples of water from Teal Lake (city water) and from the Jackson mine were sent to Dr. Vaughan for examination. I saw Drs. Lombard, Shelden and McKenzie—the physicians who have charge of nearly all the sick. They joined me in recommending to the mayor a general cleaning up of the infected portion of the city, and to advise the boiling of all drinking water, and to use the authority of the State Board of Health for the latter recommendation. I recommended to the physicians a careful and thorough disinfection of all bowel discharges, clothing and bedding of the sick. The Mayor and physicians seemed thoroughly in earnest, approved of the recommendations and promised to faithfully carry them out. They expressed many thanks for the prompt action of the State Board. The Mayor and Dr. McKenzie do not think the city water contaminated, while Drs. Lombard and Shelden believe it is, and I am inclined to their opinion. The examination by Dr. Vaughan will be awaited with interest."

Sept. 12, 1889, Dr. Avery again wrote to the Secretary as follows:

"I do not know that I stated to you that there is no health officer at Negaunee. No physician can be found who will accept it for the remuneration offered by the council."

Sept. 18, 1889, Dr. Lombard again wrote to the Secretary as follows:

"The fever continues on, from two to six new cases daily, meanwhile I hear nothing from the water sent to Ann Arbor, but daily expect to. Much of the filth from back alleys and yards has been removed and some overflowing privies renovated.

"Dr. Avery requested me to send some of our Jackson mine water for examination to Mr. Vaughan, which I did about a week since.

"The city (Teal Lake) water was sent two weeks ago. When these waters shall have been examined would like as full report as possible.

"Many of our citizens believe the city water first-class and one of our physicians says he never was as well as since he commenced drinking it. This same M. D. believes the present epidemic due to '*climatic influences only.*'"

Following are copies of Prof. Vaughan's reports on the chemical analyses and bacteriological examinations of the samples of water sent to him from Negaunee:

CHEMICAL ANALYSES AND BACTERIOLOGICAL EXAMINATION OF WATER FROM NEGAUNEE.

BY PROF. V. C. VAUGHAN, ANN ARBOR, MICHIGAN.

Chemical analysis of water from city service pipes.

	Sample No. 1.		Sample No. 2.
Free ammonia	22.8	and	23.2
Albuminoid	36.8	"	46.0
Chlorine	3.0	"	3.0
Nitrates	Trace.	and	Absent.
Nitrites	Trace.	"	Absent.

Both samples are swarming with germs and we are now trying the effects of them on animals.

V. C. VAUGHAN.

Ann Arbor, Oct. 5, 1889.

The foregoing samples were known as samples Nos. 1 and 2.

C. S. LOMBARD.

Analysis of water taken from Teal lake, 50 feet from the crib.

Free ammonia	0.206
Albuminoid ammonia	0.448
Chlorine	4.0
Nitrates	Trace.
Nitrites	Trace.
Hardness, Clark's scale	3.5°

Reaction neutral, odorless, clear.

V. C. VAUGHAN.

October 19, 1889.

Bacteriological examination of Negaunee city water, known as samples Nos. 1 and 2.

No. 1	920 germs per drop.
No. 2	1,240 " " "

Cultures of this germ in sterilized beef tea were made, kept at temperature of the body 24 hours and then injected into the peritoneal cavities of rabbits; all of the rabbits (four in number) treated in this way died, three of them in 24 hours and one in 13 days, etc., etc.

V. C. VAUGHAN.

December 9, 1889.

Report on the bacteriological examination of typhoid stools and of the organs of a man dead of typhoid fever sent from Negaunee, and general conclusions concerning the relation of the impure drinking water and the typhoid epidemic.

In my report upon the bacterological examination of certain samples of drinking water sent to me from Negaunee, I stated that I had found in these waters a pathogenic germ which is fatal to rabbits.

I have to add the following:

1. In the stools of a person sick with typhoid fever at Negaunee I have found the same germ which is fatal to rabbits.

2. From the spleen, kidney and liver of a person dead of typhoid fever at Negaunee, I have found the same germ, and when taken from these organs it is equally fatal to rabbits. I am therefore forced, in view of all the evidence, now before me, to conclude that the chain of evidence against the impure drinking water is complete, and I have no doubt that the cause of the epidemic originated in and was due to the bad water.

Respectfully,

V. C. VAUGHAN.

December 18, 1889.

The foregoing is an exact copy of Prof. Vaughan's statement.

C. S. LOMBARD, M. D.

The following quotations from letters received later by the Secretary of this Board, from Dr. Lombard, give a concise history of the continuation of this epidemic:

"Oct. 8, 1889. Report from Prof. Vaughan just received showing our city water to be very bad and Jackson Mine water hardly a whit better.

"Please send me *by return mail* a treatise of some kind from which extracts may be taken, for public reading in our daily papers, relating to what is *pure* and what *impure* drinking water.

"We have had over two hundred cases of typhoid fever thus far and I can see no tendency toward a decrease.

"The report upon the city and Jackson Mine waters was received today and shows them both to be unfit for human use. Tomorrow I will send a quart of water pumped from a deep shaft a mile or so east of the city.

"This water is said to be 'absolutely pure', but what it may contain is to a few of us uncertain. If this water be good the city may, in the future look that way for a drink.

"Thanking you for the good work being done for us, I remain, etc.

"Oct. 17, 1889. Your circulars and papers came in due time, for which accept thanks.

"Of course the published analyses of our city water have set the inhabitants all agog and many are rash enough to say that they don't credit them as true. Very many of our citizens are loth to believe that the water is as bad as represented.

"We are, *i. e.* the city people, (not the writer) in a state of agitation, for between bad water, typhoid fever, death and the almost daily mournfulness of the dirge that is pathetically piped upon our streets there is enough to quail the strongest hearts.

"We have now had nearly 300 cases—three deaths within the last twenty-four hours—the latter cases seeming most severe.

"As you are aware, we have no health officer; we have poor water, no sewerage and no sort of cleanliness and as no one seemed to take the matter in hand I have attempted it and don't mean to stop until the necessity for greater cleanliness is made so manifest that the officials will take hold and do their duty which they never will do until the *people* demand it, and *now* is the time to agitate—while sickness and death hammer at the heart.

"Oct. 25, 1889. A report upon the last sample of lake water sent to Prof. Vaughan is received and as you doubtless know shows the water to be bad; but inasmuch as it is *immensely* better than that pumped us through the pipes, points conclusively to the fact that the suction pipe, which lies upon or in the soft mud that forms the bed of the lake, is drawing in at every stroke of the piston a great quantity of the mud and filth and distributing it to the people.

"So much at least is learned, how much remains with Prof. Vaughan to tell us?

"When Prof. Vaughan shall have completed his examinations and experiments with water and germs, I shall look for a letter from you advising the proper course to be taken to give us a good water, if indeed, you think such a product can be drawn from our present source of supply.

"What you say will do much to assist us, if for no other reason than that it will come from 'headquarters.'

"I look upon Prof. Vaughan's opportunities and ability as first-class, and expect the returns will show that the people of Michigan have just cause to be proud of the man and board of which he is a member. Wishing you every enjoyment that health and honest endeavor can bestow, yours, etc."

"Nov. 6, 1889. The last sample of water sent for examination was taken from the lake, some fifty feet from the 'crib' while the two former samples of city water were drawn from the service pipes of the city. Sample No. 1 contained 36.8 Albam. Amm.; sample No. 2 contained 46. Albam. Amm., in million parts, while sample No. 3 (taken from the lake) contained only 0.448 Albam. Amm. in million parts.

"This is enough to prove, it seems to me, that much of the filth in our service pipes is sucked up by our suction pipe which lies upon the bed of the lake in a soft mud and (probably) leaks at the joints, which are of the kind known as ball joints. However, as sample No. 3 contains 0.448 it is very bad, and, as Prof. Vaughan wrote me a few days since, contains a germ which is identical with a germ found in feces of patient sent from here.

"Four rabbits out of six died inside of 48 hours after being inoculated with this germ, and examination of kidney, liver and spleen of said rabbits showed the same germ.

"The State Board of Health must need have some enemies as does every good thing that attempts to root up existing evils and prejudices. Attempting to investigate the cause of this epidemic has made me not a few enemies which I care as little about as the man in the moon, for I feel that I am on the right track and success is a pleasant thing to contemplate.

"When the cause of this epidemic shall have been shown what will the enemies of the State Board of Health then think of themselves?

"No man can be more friendly to an institution which has for its aim the prevention of disease and the physical improvement of the human race than the writer, and I look forward to the day when all your enemies shall join with your many friends in a 'long live the State Board of Health.'

"Prof. Vaughan's last report has had a salutary effect upon some of the 'kickers' and prospects seem favorable for having an improved water supply.

"I feel that I am deeply indebted to you and to the State Board for the manner in which you have worked at your end of our dilemma, and if I have seemed at times too anxious and somewhat lacking in the urbanity that should characterize a gentleman, in hastening reports, etc., attribute it, my dear doctor, to no intention but one of honor."

This epidemic in Negaunee furnishes another instance of the coincident conditions of neglect of compliance with the requirements of the law in regard to the appointment of health officers, and severe epidemics of communicable diseases. Its history points out the advisability, in all outbreaks of typhoid fever, of looking for their source in the drinking water used in the localities where they occur; and the necessity for the State Board of Health being furnished the means of causing analyses of suspected waters when occasion requires.

EPIDEMIC OF TYPHOID FEVER IN THE VILLAGE OF SAND BEACH WHICH SHOULD HAVE BEEN PREVENTED.

Between June and December, 1889, there occurred an epidemic of typhoid fever in Sand Beach during which 98 persons (nearly seven per cent of the whole population) were attacked by the disease, seven of whom died.

June 8, 1889, Dr. Peter O. Wagener, reporting the first case to this office, wrote:

"Case is here in town, a boy of 16 years of age, in the house of Mrs. Johnson. A year ago a patient was in one of the rooms with typhoid fever for three months. The room never was used since till about four weeks ago the boy took off the plastering and brought it out of the house, the room was to be refitted. A week after he took sick and lingered around for about four or five days and then came down with a severe case of typhoid fever. All possible precautions are taken to prevent a spread."

On receipt of Dr. Wagener's letter, documents on the restriction and prevention of typhoid fever, were immediately sent to him for distribution among the relatives and neighbors of those sick.

Oct. 1, 1889, Dr. Wagener again wrote to the secretary as follows:

"We have here a violent outbreak of typhoid malarial fever, there being about fifty cases in town now, but only three deaths so far. All cases with the exception of one house are on the lower flats along the lake, while the upper part of the town is free. The water is very good, there being fine wells where the water hardly ever gets higher or lower; and it is a very clean part of the town, and so is the town all over, as there was special care taken this season. The cause of the outbreak is laid to a heavy dense fog which lasted for several days and after which the fever immediately broke out."

In reply to the above letter the Secretary of this Board wrote to Dr. Wagener, Oct. 3, 1889, as follows:

"Please accept thanks for your letter of Oct. 1. By this mail I send you pamphlets on the prevention of typhoid fever, which is, I presume, the disease of which you report so many cases. I understand that the disease is 'on the lower flats along the lake.' I would like to ask if it is not probable that there is a leaching from the privies of the upper part of the town to the lower. Please investigate and see if that is not probable.

"I want to emphasize the importance of *boiling all the water drank* in that part of the town where the fever is; also the disinfection of all bowel discharges of patients."

Dec. 16, 1889, Dr. Wagener wrote two letters to the Secretary, the contents of which were as follow:

"Enclosed find final report about the outbreak of typhoid fever which was reported last June. The mode of introduction can be well traced to some cases which occurred here the year before, if you will examine the enclosed map* of the town and the course of the disease. The disease spread rapidly along both sides of the street on the lower flats, and there were the first 40 cases. Finally it reached the upper town; but the most cases were in the street in the flats.

"In regard to preventing the disease and disinfecting houses and privies, I must say there were hardly any measures taken, as the town authorities wouldn't allow a cent for expenses, and the people couldn't be induced to do anything themselves. I finally succeeded in getting the sewers cleaned, and the ditches dug out; but that was all. I called several special meetings of the board of health, but nothing could be done."

Dec. 20, 1889, the Secretary wrote to Dr. Wagener as follows:

"Referring to your diagram sent with your letter of Dec. 16, will you have the kindness to give me more definite information as follows: Just when did the case occur at Mrs. Johnston's house, 'No. 1?' Just when did *this* outbreak commence? Where is the sewer at No. 2, which discharges into the ditch along the flats? Please indicate where the ditch is, and where the street is on the flats.

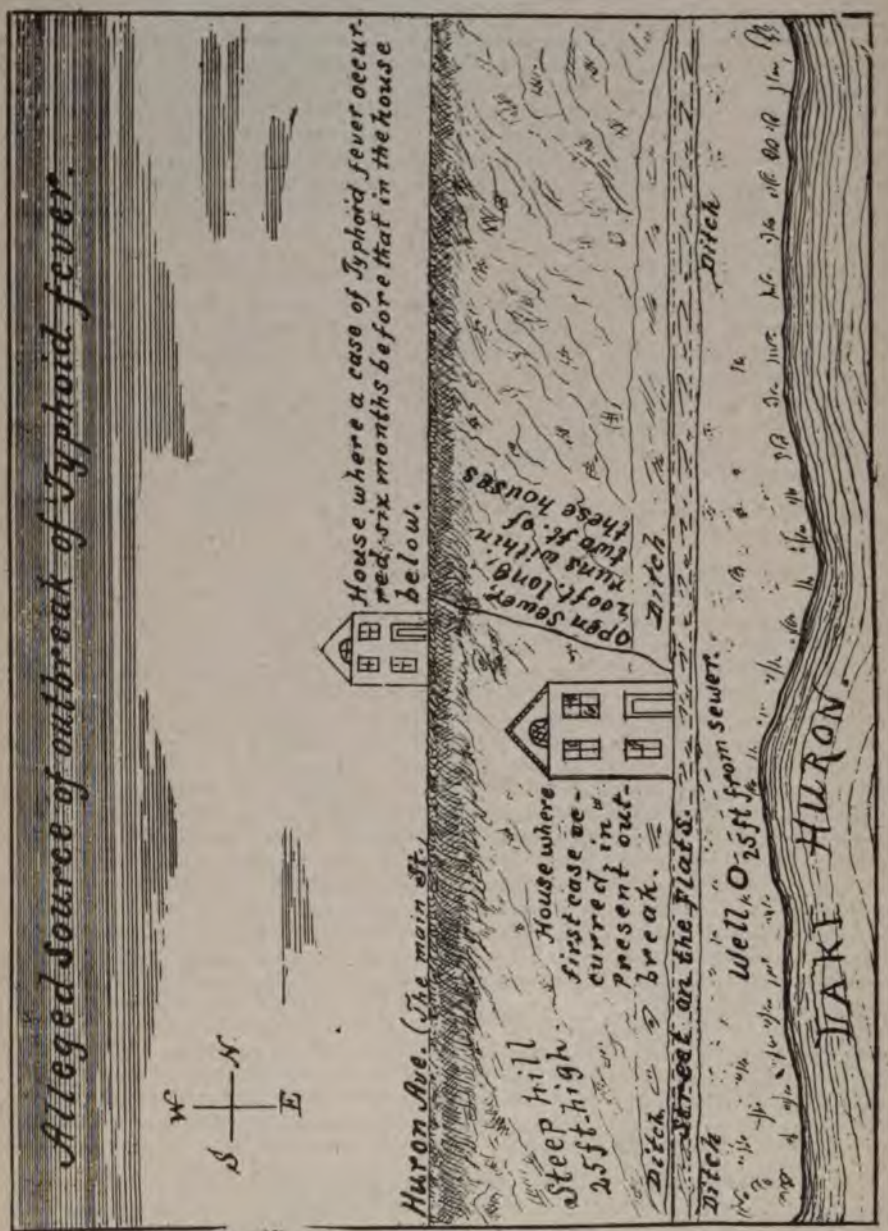
"Herewith I send you a plat of the village of Sand Beach, made from a map in this office, upon which I have placed your figures, 1, 2 and 3; but I am not certain that they are in the right part of the village. Will you have the kindness to make necessary corrections so as to make it conform to the truth, and return it to this office.

In reply to the Secretary's letter of Dec. 20, Dr. Wagener wrote on the same date:

"Your letter and diagram received. In regard to them would say: The town is situated about 25 feet above the level of the lake and about 300 feet back from the shore; but what I call the street on the flats is a street which runs below this elevation, on which the town stands, almost even with the lake. The house of Mrs. Johnson is situated right on top of the elevation, at the edge where the fall begins. Toward the lake an open sewer which is shown by the line No. 2 passes within 2 feet of the house, and goes right down to the street below, which has a ditch on each side. In this ditch the sewer empties its contents—all the filth of the upper town. The house where the fever broke out at first, is situated in the lower street as close to the sewer as the house of Mrs. Johnson is situated to it above. The sewer from Mrs. Johnson's to the house below being about 200 feet long. Within 25 feet more, toward the lake, there is also the well where the family and most all others from that street took their water. The case at Mrs. Johnson's was about 4 months and 20 days before the outbreak took place; but was a violent case and was under treatment for 4 months, the patient being in bed most all the time. There were several attendants to this patient, and I believe that probably not great care was taken in disposing of the excretions. If some of them were put in the sewer, about 2 days before the outbreak, there was a rain storm which might have transferred them to the ditch below, and out of that with the surface water to the well. Whatever was the way of transfer, it all at once spread all over the lower street, and there was but one house excepted (the occupants of that house being no water people, but strong whiskey drinkers, and they immediately on the outbreak used that antidote to a terrible extent, it was the most dirty place but they escaped). As to the correction of the diagram, I would say that the lower street runs along the shore, and the enclosed diagram will be found correct. Another reason which makes me think the cause of the outbreak came from the house of Mrs. Johnson is this, and I think it is of great importance. Where the sewer which comes from Mrs. Johnson's place down the hill to the street on the flats, and where it empties its contents into the ditch which runs along the street, the ditch has its fall towards the south, and not a house north of the sewer had the disease; but all the infected houses were south of it, the direction in which the poison would be naturally carried with the flow of the water."

The diagram which follows, and which was made in this office from sketches and explanations by Dr. Wagener, graphically portrays the rise and progress of this epidemic. If the contagium which caused the epidemic came from the patient who had the disease in Mrs. Johnson's house a year prior to its commencement, the inference is that had the restrictive measures recommended by this Board been strictly adhered to in that case, the suffering and loss by death, etc., occasioned by this epidemic, would have been avoided.

* The "map" or diagram "Alleged source of Outbreak of Typhoid Fever" in Sand Beach, is printed on next page.



TYPHOID FEVER ATTRIBUTED TO CONTAMINATED WATER IN A CREEK.

Fred K. Smith, health officer of the township of Allouez, Keweenaw county, in reporting the source of contagium in an outbreak of typhoid fever in that township, which resulted in 13 cases between Aug. 5 and Nov. 20, 1889, wrote:

"Supposed to be water from Hill's Creek, which was used by all the families; but source of contamination of creek could not be determined as it does not drain any inhabited area excepting a few isolated

houses where no cases were known, and a lumber camp used in winter only. In that lumber camp, however, there were three cases of typhoid contracted last winter, and two or three the winter before. There have been no cases in neighborhood of present epidemic for at least four years."

THE WAY TO PROPAGATE TYPHOID FEVER.

The following letter dated December 16, 1889, and a sketch illustrative thereof, which is given below, were received at this office from Dr. J. M. Collier, health officer of the village of Plymouth:

"Sketch briefly shows the relation of the houses to the source of contagion in the recent outbreak of typhoid fever in this village. They were built for the use of tenants, are located at the southern outskirts of the village on low ground. The well was located midway between the two houses, is only *six feet* deep, and after the drouth of the past season was established, the pumping of two or three pails of water would empty it. About twelve feet each way from the well were the two privies as indicated, both had shallow vaults, filled with excreta in as foul condition as neglected vaults could be.

"Between the privies and the well, as indicated by the + were two cess pools.

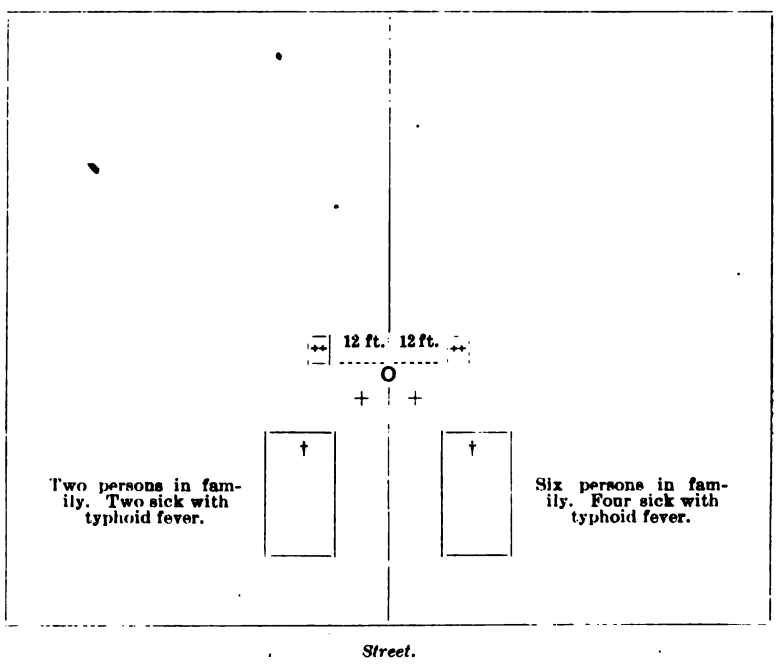
"The vaults were ordered cleaned and thoroughly disinfected, and the privies removed to rear of the lots. Cess pools disinfected and filled.

"The use of the water from the well was discontinued, after which there were no more cases of the fever.

"The S—— family contained six members, four of whom had the fever. The L—— family consisted of but two members, both had the fever. In all six cases, none of which, fortunately were fatal.

"This outbreak serves as one more witness to the danger of the use of impure water, and precludes the supposition of the source of the fever being other than from this cause."

Two residences in the village of Plymouth, Michigan:



† Houses.
‡ Privies, "shallow vaults."
+ Places where slops were thrown.
o Well, six feet deep, "the pumping of two or three pails of water would empty it."

Of an outbreak of typhoid fever which occurred in the township of Empire, Leelanaw county, early in 1889, the health officer, H. C. King, reports the source of contagium as follows:

"I think the source of disease a well 51 feet from vault and 150 feet from barnyard; vault was used by a typhoid patient in July, 1888. Other cases from drinking water from barnyard drainage and slop refuse."

In this outbreak there occurred seven cases and three deaths.

TYPHOID FEVER AND LOW WATER IN WELLS COINCIDENT.

Dr. Mason W. Gray, of Pontiac, in reporting a case of typhoid fever which occurred at Amy, Avon township, Oakland county, wrote to this office as follows:

"I believe this case of typhoid fever at Amy, originated in the old well from which the family have used. The well has been in use for more than fifty years, is thirty feet deep and situated a distance of thirty-five feet from a stable which has been used as a tavern barn for years, about forty-five feet from the tavern privy which has a well filled, unwalled, uncared for vault, and ten to fifteen feet from the kitchen door of the tavern out of which are thrown the slops and refuse from the house. The soil is sandy and you may believe me that the ordinary chemical tests show the water of this well to be loaded with chlorides and organic matter.

"The patient sickened toward the close of the protracted dry spell, at a time when there was about one foot of water in the well whereas the residents of the community assure me that ordinarily there are five to six feet of water in it. The patient was married about one year ago. Immediately after marriage, he and his wife started for Minneapolis, where he is in business; but on reaching Chicago she was taken with typhoid fever and had a severe attack. This winter they both returned to her home where they were visiting at the time the husband was taken sick. Other cases of fever have occurred among those using water from this well but none which have been called typhoid so far as I can learn, aside from these two."

The following information and drawing,* furnished by O. F. Seeley, health officer of the village of Climax, described conditions existing on premises in that village where a fatal case of typhoid fever occurred.

Dr. Seeley wrote:

"Aug. 5, 1889.– A case of typhoid fever has been reported to me, and as there is much speculation as to its origin, I hereby send you a rough drawing of the house and surroundings.

"The well is a dug well twenty-eight feet deep, but owing to a failure of water, an iron pipe was driven about eight feet in the bottom of the well.

"The distance from the well to the privy is about forty feet.

"The privy stands upon a vault six or seven feet deep, walled up.

"The character of the soil from the bottom of the vault to the water level is sand and coarse gravel. The privy is about six feet from the wood shed, but the roof covering the privy extends to the wood shed, and the space between the privy and the wood shed is enclosed and has no ventilation. West of the house, and perhaps fifty feet from the well, the drain empties into a place which was dug some ten or twelve feet deep and filled with stone.

"The character of the soil and depth of wells in our village are uniform, and I find a number of privies not more than fifty feet from the well, some less. The house I have described has been used some twelve years.

"I am testing the water with the sugar test. Can you give me any better method?

"I have one question which I would like to have answered, and that is this: Will a tubular or drive well which is driven ten or twelve feet below a stratum of impure water reach one that is pure, or may it do so? Would it be safe to use water out of the drive well, where it would not, out of the open well which is supplied from the first stratum?"

"Sept. 10, 1889. The surroundings are suspicious and we wish to have the water analyzed. Can you tell me where I can get it done, and what the expense will be?

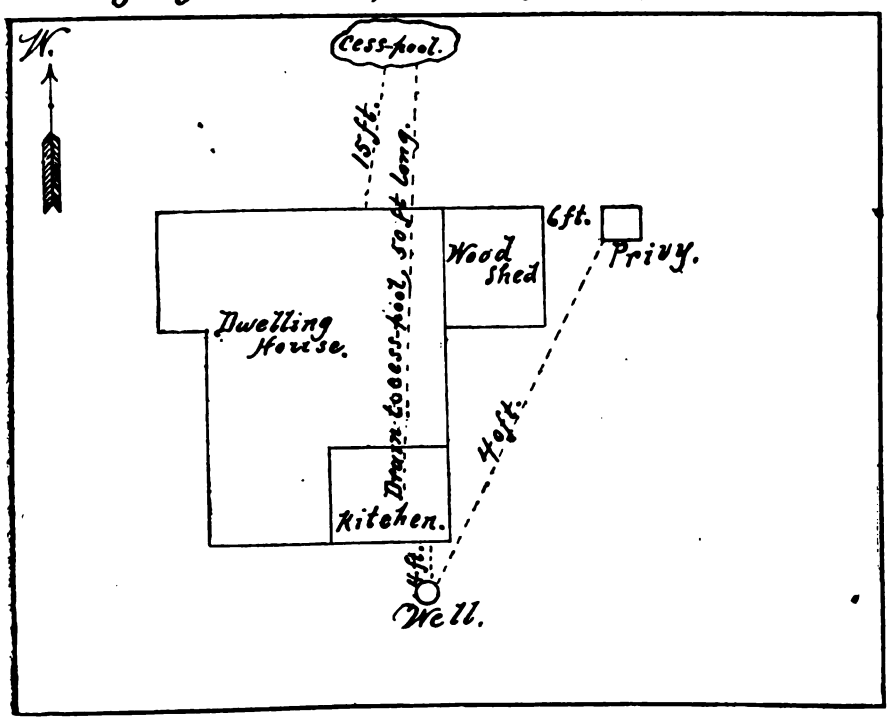
"The patient was at the house only for his meals and lodging and drank very little of the water from the well.

"The slops from the sink are conducted into an open tube or box under the kitchen floor. This box opens about one foot below the floor, and communicates directly with the pit some fifteen feet from the

* The diagram "Premises where Typhoid Fever occurred in the village of Climax, Michigan." rinted on next page.

house. This pit is about eight or ten feet deep, filled with stone and covered with earth. The odor from this, at times, is said to be very offensive. There is an open space in the wall where this tube passes from the sink to the pit, so that the gas is not confined under the kitchen floor."

Premises where Typhoid Fever occurred in the Village of Climax, Michigan.



In reply to the questions contained in the foregoing communications, the Secretary of this Board wrote to Dr. Seeley as follows:

"Aug. 7, 1889. Your letter with drawing of house and surroundings, has been received. There is what seems to be good evidence that the cause of typhoid fever will pass through sand and gravel with water to a considerable distance, even as far as half a mile; and I would not consider it safe to use, without boiling, water from a well, tubular or open, which is 'ten or twelve feet below a stratum of impure water.' It might be a little safer to use water from a tubular well than from an open well, because if the tube passed through a stratum of impervious clay there might not be much leakage down the side of the pipe; but we should remember that all water in the lower stratum has probably come from an upper stratum and the chances would usually be in favor of its coming from *very near by*.

"The conditions you describe are such as to lead me to expect typhoid fever to be reported from such a place. I think that the water from such a source should never be used even for washing or rinsing dishes until after it is boiled. Especially should that precaution be taken with tins and other vessels in which milk is to be stored. Outbreaks of typhoid fever have been attributed to, and apparently caused or communicated by, rinsing milk tins with contaminated water."

"Sept. 11, 1889. Please accept thanks for your final report of the outbreak of typhoid fever in your jurisdiction beginning July 22, and for the accompanying letter.

"I will say in reply that the State Laboratory of Hygiene, at Ann Arbor, is prepared to make chemical and biological examinations of waters, as you will see by the accompanying pamphlet. These examinations will be made and charged for at the actual cost of analysis."

ANALYSES OF SUSPECTED WATERS REQUESTED.

A great many applications for analyses of suspected waters are received at this office from health officers in whose jurisdictions outbreaks of typhoid fever occur.

Following are extracts from a few of the many such applications received by the Secretary of the Board during the year 1889:

Nov. 15, 1889, Dr. N. D. Yale, health officer of Deerfield township, Lenawee county, wrote:

"We are having an epidemic of typhoid fever, not extensive as yet; but I have a fear that it may become so.

"In each of three houses situated on two sides of an angle, the back end of lots touching, there are cases All use the same water, well, and milk from the same cows. The proprietor of the well has a hired man (not living with him) down with the fever, and a nephew, each of these have drunk from this well.

"Our schools have been getting water there also until a few days since, when I had it stopped.

"I do not know that there are any other cases of the fever in our village.

"All are children 8 to 16, except one.

"The owner of the well is very positive the water is all right.

"I would be glad to have the water examined, but have no funds for that purpose. Could the State Board give us an analysis?

Dr. Chas. H. Dale, health officer of Springport township, Jackson county, writing to this office July 31, 1889, says:

"I report to you two cases of typhoid fever and the third one coming down with the disease. * * *

"I would like to know the source of the contagion, therefore I will give you the history so far as I have been able to learn:

"A brother of the above children had been attending school in Ypsilanti and came home. About ten days or two weeks after he came down with an attack of typhoid fever, so the attending physician diagnosed it. I saw this case in consultation one week after; but patient was in a dying condition, caused by exhaustion from epistoxis. About a week or ten days after the other brother was attacked. I ordered them not to use any of the water from the well, which I examined and found the platform open and in a bad condition. I would like to have some of the water analyzed. Could I send you a sample and have you analyze it? What would be the expense? Or does the State bear the expense of such investigation? * * *."

In reply to Dr. Dale's letter the Secretary of this Board wrote to him August 1, 1889, as follows:

"I would say that there is no laboratory connected with this office, and no appropriation for this Board for the purpose of making analyses of water. Analyses can be secured of Prof. R. C. Kedzie, of the Agricultural College, and Prof. A. B. Prescott, of the State University, at a cost depending on the kind of analysis which you desire, whether quantitative or qualitative, chemical or biological, or both.

"The State Laboratory of Hygiene is now prepared, it is understood, to make analyses at the bare cost. The director of this laboratory is Prof. V. C. Vaughan, M. D., of the State University, who will give you a statement of cost if you state to him just what you wish."

Dr. O. A. Dean, health officer of the village of South Haven, in reporting in regard to an outbreak of typhoid fever in that village, which resulted in 25 cases and one death, wrote October 14, 1889:

"These cases cannot be shown to have any inter-dependence, as they are scattered around the village and widely separated. The cause or causes of the trouble are therefore problematical. I am of opinion that there is very little water in town that is good.

"I should much like if samples of the water here could be analyzed. Does the State Board of Health do that?"

In reply to Dr. Dean's question the Secretary informed him that the State Board of Health does not make analyses of water, but that the State Laboratory of Hygiene at Ann Arbor, is prepared to make such analyses,

by request of the State Board of Health, and will do so at the actual cost of analysis.

January 4, 1889, Dr. H. R. Mills, of Port Huron, wrote to the Secretary of this Board as follows:

"A family in the country has been very severely afflicted with typhoid fever, and the physicians in charge propose an examination of the drinking water. It is from a well near by the house and near an old privy vault. They have requested me to write you and get the particulars of procedure and about what the examination will cost."

In reply to Dr. Mills' letter the Secretary wrote to him Jan. 8, 1889, as follows:

"I send you a pamphlet in which I have marked paragraphs from which you will see that you can get the water analyzed at the State Laboratory of Hygiene at the University for the bare cost of analysis. A sample of the water (at least a gallon) should be put in a clean jug which has been recently rinsed with boiling water. The jug should be carefully corked up, sealed and addressed to Prof. V. C. Vaughan, M. D., Laboratory of Hygiene, Ann Arbor, Mich. Your letter to Prof. Vaughan should state that I have recommended the testing of this water."

Dr. A. E. Anderson, health officer of Iron Mountain, wrote to this office Sept. 16, 1889, as follows:

"In answer to your enquiry about the drinking water where cases of typhoid fever have occurred, I will state that the entire city of Iron Mountain is supplied from shallow wells sunk here and there regardless of sources of contamination.

"We have done much work lately attracting people's attention to the danger of having their wells contaminated. We have condemned many, all containing over one grain chlorine to the gallon or having any bad taste or smell. We could not make complete analysis of each well; the health officer is not paid enough for that. I will send you a box containing samples of water where cases have occurred.

"I would especially draw your attention to the sample of water from Blight's hotel as being the one most likely to contain typhoid bacilli. There have occurred five well marked cases in this hotel since August 3, 1889."

The foregoing extracts seem to emphasize the suggestion already made in this article,—that this Board be furnished the means of causing analyses of water, from contaminated or suspected sources of supply, to be made, when such analyses shall by it be deemed necessary or advisable.

SYMPTOMS OF TYPHOID FEVER DESCRIBED.

During the months of August and September, 1889, typhoid fever prevailed in the city of Iron Mountain. Twenty cases of sickness and two deaths were reported to have resulted from that disease, in that city, during the two months mentioned. September 16, 1889, the health officer of the city, Dr. A. E. Anderson, wrote to this office, in regard to this outbreak as follows:

"The cases here so far have been mild and of short duration, the average not being more than 15 days. Only two deaths have occurred, and that was in infants where a typhoidal condition followed ordinary summer complaint."

In reply to Dr. Anderson's letter the Secretary of this Board wrote to him, Sept. 26, 1889, as follows:

"Please accept thanks for your letter stating that no fatal cases of typhoid have occurred with the exception of two children in whom typhoidal symptoms have followed summer complaint. Will you have the kindness to inform me just what the signs and symptoms were in the cases? Those who used water from the same well as that from which the water sent for analysis came. I wish to know this in connection with the analysis of the water, which has been received, and sent to Prof. Vaughan at the University. Will you also state on just what signs and symptoms you base your diagnosis of typhoid fever?"

In reply to the last question asked in the above letter, Dr. Anderson wrote:

"In answer to yours of the 26th inst., requesting information as to signs and symptoms we base our diagnosis of typhoid fever on, I will give you the case of Mr. Gill, who had at times used water from the Brockington well. He complained for several days before taking to bed of pain in the head (frontal region), pain in the legs and back of neck, loss of appetite, chilly sensations and general feeling of lassitude. After taking to bed there was epistaxis, diarrhea (ochre-colored stools with the characteristic smell), dull, stupid appearence, mild delirium, coated tongue, sordes, marked tenderness on pressing over the right iliac region, tympanitis, the rose-colored eruption, which is rare here, was well marked on the 9th day. There was a distinct morning and evening variation in temperature, being from one to two degrees higher in the evening; highest point reached being 105½. The temperature came down to normal on the 21st day from taking to bed. Appetite returned, and in a couple of weeks he had entirely recovered. Case of J. Eklund, who boarded at Blight's hotel, was similar, but the eruption was not noticed. This patient was for several days in a state which might almost be called coma vigil.

"There have been many cases not so well marked. I regard the two above as typical enough to be positive of the diagnosis."

ACTION OF THE STATE BOARD RELATIVE TO REPORTING TYPHOID AND TYPHO-MALARIAL FEVERS ENDORSED.

In 1889, as in former years, many complaints were received at this office from health officers of neglect by house-holders and physicians to comply with the law, which requires them to report every case of typhoid fever (or any dangerous communicable disease) occurring in their houses or practice, to the health officer in whose jurisdiction it occurs. It was stated by some health officers that many physicians, in order to cover past neglect of, or to evade future compliance with this law, called cases of typhoid fever *typho-malarial* fever, which they contended they were not required to report. In view of these facts, and in order to avoid their future recurrence, this Board, at its meeting October 8, 1889, adopted the following resolutions:

Resolved, That in the opinion of this Board all cases of so-called "typho-malarial fever" should be reported to the local health officer, and the same precautions taken as in cases of typhoid fever.

Resolved, That all cases of fever of doubtful origin continuing more than seven days should be reported to the health officer, and precautions taken as in other diseases dangerous to the public health, such as typhoid fever.

The following extracts from letters received at this office since the adoption of the above resolutions, seem to show appreciation of the action of the Board in adopting them:

October 15, 1889, Dr. H. M. Gale, health officer of Bay City wrote:

"Last night at the monthly meeting of the Bay County Medical Association I read your communication of October 9, giving resolutions passed by the State Board of Health of that date. All seemed favorably impressed with the resolutions, and I think hereafter my efforts to make reports will be seconded by the association. * * * *.

"I think it would be a good plan to issue a number of official circulars from your office, so that each physician may have a copy of the resolutions passed by the State Board, and requesting them to make a full report to the local board at least every Saturday, for though I am on the whole on the best of terms with the physicians here, yet a communication coming from you would have more weight than any appeals that I might make.

"If you think fit to send me a number of copies of those resolutions, and any additional request, to urge them to sustain the action of the State Board, I shall see that each member receives a copy. We have about 40 physicians in the city."

The following preambles and resolution were adopted by the local board of health of the city of Grand Rapids, Nov. 1, 1889, and a copy was mailed

to each physician in the city, and published in the local newspapers. The preambles and resolution are as follows:

Whereas, The State Board of Health has by resolution declared Typhoid Fever a disease dangerous to the public health, and under the law all such diseases are required to be reported to the health officer, and the necessary precautions are required to be taken by him;

And Whereas, The State Board of Health, at their regular meeting, held Oct. 8, 1889, did by resolution declare, that all so-called cases of Typho-Malarial Fever, and all cases of Fever of doubtful origin, continuing more than seven days, are diseases dangerous to the public health, and should be reported to the local health officer, and precautions taken as in other diseases dangerous to the public health, such as Typhoid Fever;

And Whereas, The State Board of Health urgently requests the local boards of health to co-operate in taking measures to prevent the spread of these diseases; therefore,

Resolved, By the Board of Health of this city, that the disease known as *Typho-Malarial Fever*, and all cases of Fever continuing more than seven days, are diseases dangerous to the public health, and must be reported to the health officer of this city, the same as is required by law, "for all diseases dangerous to the public health;" and the health officer is hereby instructed to placard these diseases, and take the same precautions as required to be taken in cases of Typhoid Fever.

C. W. CALKINS, *President.*

Attest: H. N. CARGILL, *Secretary.*

Negligence has existed in promptly reporting cases of contagious disease, and by so doing, physicians and all other persons required by law to report, subject themselves to the penalty for violating the law, which will be strictly enforced.

WILLIAM G. SAUNDERS,
Health Officer.

At a meeting of the Detroit Board of Health Nov. 12, 1889, the following resolution was adopted:—

Resolved, That all cases of Typhoid fever be reported, and that it is not necessary to placard the houses where such patients are sick.

This action by the Detroit board of health is not quite in accord with that by the State Board of Health, which recommends that local boards of health "give public notice of infected places, so that no person may unguardedly drink water or take food from a source likely to be contaminated."

Nov. 13, 1889, Dr. F. W. Rogers, health officer of Green township, Mecosta county, wrote:

"Your circular concerning the reporting of cases of typhoid fever and so-called typho-malarial fever, received this day. I agree perfectly with Dr. Lee of Saginaw in his opinion that many physicians always call a continued fever typho-malarial if the patient recovers, and if he dies, call it the 'old fashioned typhoid fever.' I have frequently seen very able physicians call fevers malarial fevers which were in character steady, continued fevers, lasting three, four or even five weeks, and in which there was no intermission or remission more than is seen in any typhoid fever."

The circular referred to by Dr. Rogers, and of which a copy was sent to each health officer in the State is printed below:

"TYPHOID AND TYPHO-MALARIAL FEVER.

"EXTRACTS FROM THE PROCEEDINGS OF THE MICHIGAN STATE BOARD OF HEALTH AT ITS MEETING OCTOBER 8, 1889.

[161.] A new law (in 1889.)

Every Case of Typhoid Fever Should be Reported to the Health Officer.

[Memorandum by the Secretary of the State Board of Health.]

Typhoid fever is a disease which the State Board of Health has declared to be "dangerous to the public health," and as such it comes under the law requiring physicians to report to the health officials. Any physician

who shall neglect to immediately give such notice "shall forfeit for each such offense a sum not less than fifty nor more than one hundred dollars." *After Oct. 1, 1889, any householder* who shall refuse or willfully neglect immediately to give such notice shall be deemed guilty of a misdemeanor, and is liable to a fine of one hundred dollars or in default of payment thereof may be punished by imprisonment in the county jail not exceeding ninety days.

It seems important that the people generally shall understand this new law which applies to scarlet fever, diphtheria, small-pox, and all such dangerous diseases as well as to typhoid fever; but at this time of the year typhoid fever is usually most prevalent, and it is especially dangerous in times of drouth, therefore the safety of the people may now be greatly promoted by having every case of typhoid fever reported to the health officer, who is by law (section 1, Act 137, laws of 1883) required to promptly attend to the restriction of every such disease. A new law, which took effect Oct. 1, 1889, makes it a misdemeanor punishable by fine or imprisonment for the health officer knowingly to violate that section of the law, or for any person knowingly to violate the orders of the health officer, made in accordance with that section. But the actual penalties which are incurred by the violation of these laws are the *death penalties* to many of our people, about one thousand being lost in this State each year from typhoid fever. The saving of a large proportion of these lives is the real reason for the effort in which it is hoped all our people will join, for the restriction of typhoid fever, and other dangerous diseases.

"THE LOCAL BOARD OF HEALTH SHOULD MAKE AND PUBLISH REGULATIONS DECLARING TYPHOID FEVER A DISEASE DANGEROUS TO THE PUBLIC HEALTH.

The State Board of Health has declared typhoid fever to be a "disease dangerous to the public health" under the law requiring such diseases to be reported to the health officer and precautions to be taken by him. However there is still some difficulty in securing prompt reports in some parts of the State relative to this disease. The following resolution was therefore adopted at this meeting of the Board. [Oct. 8, 1889.]

Resolved, That the local boards of health throughout the State be urged to second the action of the State Board of Health by making "regulations" declaring typhoid fever a "disease dangerous to the public health" which should be reported to the health officer in accordance with the law.

The local board of health is required by law to make and publish such regulations as it may deem necessary for the public health and safety. Some of the sections of law providing for this are as follows:

Respecting articles capable of conveying contagion, etc.

(1695.) SEC. 4. The said board shall also make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from, their township, or into or from any vessel; and if any person shall violate any such regulation, he shall forfeit a sum not exceeding one hundred dollars.—§ 1636, Howell's Statutes.

Notice of regulations, how published.

(1698.) SEC. 7. Notice shall be given by the board of health of all regulations made by them, by publishing the same in some newspaper of the township, if there be one published therein, and if not, then by posting them up in five public places in such township; and such notice of said regulation shall be deemed legal notice to all persons.—§ 1639, Howell's Statutes.

When board of health to provide hospital.

(1730.) SEC. 39. When the small-pox or any other disease dangerous to the public health shall break out in any township [city or village, § 1681 Howell's Statutes], the board of health shall immediately provide such hospital, or place of reception for the sick and

infected, as they shall judge best for their accommodation and the safety of the inhabitants; and such hospitals and places of reception shall be subject to the regulations of the board of health, in the same manner as hereinbefore provided for established hospitals.—§ 1671, Howell's Statutes.

"CASES OF TYPHO-MALARIAL FEVER SHOULD BE REPORTED.

The Secretary of the Board mentioned outbreaks of fever in Michigan which were called "typo-malarial" in which there were deaths. In some instances it was thought that cases of typnoid fever were called typho-malarial to evade the law requiring cases of typhoid fever to be reported to the health officer and precautions to be taken. He read extracts from a letter from N. D. Lee, M. D., health officer of Saginaw, requesting the State Board of Health to adopt some positive rule or decision in regard to typho-malarial fever and typhoid fever. The letter stated that "We have many cases of typhoid fever in this locality and nearly every case that is not bad enough to kill, is called typho-malarial fever, and I do not hear of it (and it is the case in all large towns and cities) only by rumor or seeing it in the papers, after the patient is well or dead. We have more deaths from the typho-malarial fever than we do from the typhoid fever as reported."

After considerable discussion the following resolutions were unanimously adopted:

Resolved, That in the opinion of this Board all cases of so-called "typho-malarial fever" should be reported to the local health officer and the same precautions taken as in cases of typhoid fever.

Resolved, That all cases of fever of doubtful origin continuing more than seven days should be reported to the health officer, and precautions taken as in other diseases dangerous to the public health, such as typhoid fever."

ISOLATION OF PERSONS SUFFERING FROM TYPHOID FEVER.

Communications received at this office show the existence of widely different opinions held by physicians and citizens of the state, in regard to the necessity of isolating persons attacked by typhoid fever; and also that the recommendations of the State Board of Health, relative to this precautionary measure are sometimes misinterpreted. Although this Board, in its pamphlet on "The Prevention of Typhoid Fever," states that it would be wise, for all who can properly do so, to keep away from premises where typhoid fever exists, it as distinctly states in the same pamphlet, that separation of the sick from the well is not *absolutely* necessary. As bearing on this subject the following extracts from correspondence of this office, with local health officials of the State, are given:

November 18, 1889, Dr. H. W. Marsh, health officer of the village of Chesaning wrote:

"Enclosed find clipping from the 'Chesaning Argus' of a recent date. Does this article state the truth?

"Some two months since Dr. Eldred, of this village, made complaint to me that his son was sitting (at school) in a seat with a boy whose sister had (so reported by Dr. Mudge) typhoid fever. I made known the facts to the school board and advised temporary suspension of the boy who came to school from the house where the fever existed. The board did so suspend. Was it right? * * *"

The clipping mentioned by Dr. Marsh is as follows:

"Dr. Henry B. Baker, secretary of the State Board of Health, says that it is not necessary for children who live in houses where there is typhoid fever to be kept out of school, for reason that the disease is not transmitted by contact. Nothwithstanding the doctor's statement parents very much dislike to have their children mingle with those that are closely allied to the disease."

In reply to Dr. Marsh's letter the Secretary wrote to him November 19, 1889, as follows:

"In reply to your letter of November 18, with enclosed clipping, I think that the whole paragraph is true, both what I say and what the editor says. That is, while there is not much danger of typhoid fever being communicated in this way, still most parents would dislike 'to have their children mingle with those that are closely allied to the disease.'"

In October, 1889, Dr. H. C. Brown, health officer of Muskegon, wrote:

"I write for information concerning children attending school where there is typhoid fever in the family. Is there any law compelling them to remain at home? Do you deem it advisable or necessary to keep them out of school?"

In response to Dr. Brown's letter the Secretary wrote to him October 23, 1889:

"I would say that in my opinion it is not necessary to keep children out of school, from houses in which there are cases of typhoid fever. Typhoid fever is a dangerous *communicable* disease; but not usually spread by contact."

EFFORTS FOR THE PREVENTION AND RESTRICTION OF TYPHOID FEVER.

It is gratifying to note that in addition to increased interest on the part of local health officers in carrying out the preventive and restrictive measures recommended by the State Board of Health in outbreaks of typhoid fever; that many of those officials have been very zealous in efforts to induce physicians to report cases of that disease occurring in their practice, and to obtain amelioration of the water-supply in localities where typhoid fever has occurred, and in advocating the introduction of systems of sewerage in their jurisdictions.

The following extracts from letters and reports received at this office illustrate the nature of the efforts made by those officials, and show that those efforts are not always made under the most encouraging or favorable circumstances.

Dr. S. J. Hutchinson, health officer of Leelanaw township, reporting cases of typhoid and typho-malarial fevers, in his annual report says:

"In all cases of both diseases it was undoubtedly owing to the drinking of foul water by members of the three families in same neighborhood, and by all the others also.

"Drive wells extending to a good depth, are advocated in that neighborhood and elsewhere. One has already been driven and is in use. Boiling the water and milk also practiced. Drainage improved. Privies are to use dry earth, etc."

Dr. Adolph Hockstein, health officer of Kalamazoo, wrote:

"I have attended 20 meetings of the city council since April 9, 1888, and the following notices, resolutions and ordinances have been passed by that body on my recommendation.

"5. The adjacent property owners of the Arcadia Creek are ordered to remove their privies to a distance of at least 8 feet.

"6. Several parties ordered to connect their premises with the public sewer.

"9. Physicians requested through the daily papers to report cases of typhoid fever.

"11. A locality known as a breeding place for typhoid fever recommended to be furnished with the Holly water."*

Dr. Jas. A. King, health officer of Manistee, wrote:

"It is the hardest work we have to teach people that poison may lurk in their particular well. They say their water is pure and must be good. 'We have got good water' is the universal answer to your advice to boil it. * * * * *

"I am working hard and spend a great deal of time visiting houses, inspecting plumbing, vaults, cesspools, etc., and work long and laboriously at each council meeting to get ordinances touching the

*Only that part of Dr. Hockstein's report which bears on typhoid fever is here given.

disposal of dead cats, manure, kitchen slops, etcetera, in our alleys. I hope to get the city somewhat cleaner before fall, and introduce dry earth on streets not sewered."

H. C. Brown, health officer of Muskegon, wrote:

"There have just come to my notice three or four deaths from typhoid fever. I did not know of the existence of the fever in the city before.

"I have commenced legal proceedings against a number of physicians for not reporting said diseases.'

Dr. A. E. Anderson, health officer of Iron Mountain, says in a letter:

"We have done much work lately attracting people's attention to the danger of having their wells contaminated. We have condemned many, all containing over one grain chlorine to the gallon, or having any bad taste or smell."

DIFFICULTIES EXPERIENCED BY LOCAL HEALTH OFFICERS IN RESTRICTING TYPHOID FEVER.

Some of the difficulties which local health officers experience in the performance of the duties required of them by law, are shown by the following extracts from correspondence of this office with those health officers in regard to typhoid fever:

N. D. Lee, M. D., health officer of Saginaw, reporting an outbreak of typhoid fever in that city, says:

"The danger of the spreading of the disease from or into the jurisdiction of other boards of health is great, for the reason that infection is easy. Water from a swamp with 15 or 20 privies and hog pens in it, dirt abounds everywhere, a genuine Poland neighborhood. I cannot tell what will be done, if anything. They are a hard lot and poor as Lazarus, cannot be taught, and are a tough lot to be compelled to do anything."

Dr. C. L. Chandler, health officer of Richmond, Macomb county, reported as follows:

"One of the cases reported to you today has continued four weeks without being reported by the physician in attendance or the householder. What shall be done with them for this failure?"

In reply to Dr. Chandler's question the Secretary of this Board wrote to him as follows:

"Enclosed I send you a leaflet with the law, relative to the matter about which you ask, marked. When any infringement of this public-health law comes to your knowledge, it is your duty to notify the supervisor, and his duty to prosecute: that is true in a township; in a city or village the health officer should notify the prosecuting attorney. This is in reply to your question."

Dr. Chandler again wrote, Nov. 30, 1889:

"The final report I send you is incomplete, for the reason that one house-holder refused to have his house placarded or disinfected. He and the physician did not report the disease until the patients were well, four weeks after they were taken sick.

"The supervisor thought best not to prosecute them."

Dr. A. J. Abbott, writing from Emmett, St. Clair township, says:

"There has been reported to me by Dr. Parry of Brockway, a case of typhoid fever in my township.

"A strange feature of the case is that the Doctor reported the case to me typhoid, and to the friends denied any such disease.

"The friends are ready to eat me up because I placarded the house.

"They refuse all information [in regard to questions in Final Report] and are too belligerent to allow me to do anything without force, which I think unnecessary. I report case to my Board."

S. M. Scott, health officer of North Star township, wrote, Dec. 31, 1889, as follows:

"The physician here reported a case of typhoid fever to me and I posted notice according to law. The family became alarmed and sent for another physician from Ithaca and he came down and diagnosed the case without consulting with the physician in attendance, and pronounced it some other disease, and is treating the patient now, the family discharging the physician in attendance. In the morning I found the notice torn down. Please inform me in regard to the matter and oblige."

In response to Mr. Scott's letter the Secretary wrote to him Jan. 2, 1889, as follows:

"I herewith send you pamphlets, etc., on typhoid and typho-malarial fevers.

"It is the opinion of this Board 'that all cases of fever of doubtful origin continuing more than seven days should be reported to the health officer, and precautions taken as in other diseases dangerous to the public health, such as typhoid fever.'

"Act No. 137, laws of 1883, as amended by the last legislature, makes it a misdemeanor for any one to violate the orders of the health officer, made under and in accordance with this law, punishable by a fine, and imprisonment if the fine is not paid. The people should be informed of this law, and that your orders are made under and in accordance with this law."

The following letter, received from Dr. W. A. S. Williams, health officer of Petoskey, although pertaining only in part to this subject, is here printed in full, as containing matter of interest in considering the conservation of the public health.

"The resort season is nearly over and most of the resorters are gone home, and do you know that I feel an inward gratification in realizing the fact that notwithstanding the large number of visitors here, made up of men, women and children, from every part of our country and Canada, that sickness has been almost a dead letter, it surely has so far as any epidemic goes, and I think I can safely say even endemic, of any consequence. There has not been a case of diphtheria, scarlet fever or typhoid fever, except the case of Mr. Thorit, who came from Hillsdale or Albion and came down with it two days after his arrival, and although was sick some four weeks before he died, no other cases followed in this place. I cannot understand why that case was not reported to me. *

"As far as I can ascertain the measles at Bay View was brought there by a child coming there from Joliet, which case was never made known until afterwards.

"You see that the business at Bay View, Wequetonsing and Harbor Point, is done chiefly by resorting physicians, and I suppose they feel a sort of resorting diplomacy relieving them from any legal requirements. In fact I don't suppose they think of it.

"We are agitating the question of sewers, and imploring the municipal authorities to take immediate action; but we are young up here in finances and growth; but the lay of the ground here is superb for a system of sewers and they must come, for the addition in the population here every summer demands it, as the place will soon be honeycombed with privy vaults; and it seems almost impossible to get people to clean them, and in almost every instance notices have had to be served and the bills paid by the council and taxed up against the property.

"I have submitted to more indignity and abuse for a little paltry $75 than ever will occur to me again for that price; but as long as I am health officer, I will do my duty.

"The general health of the people here, in my judgment, is not solely attributable to climate; but to the pure drinking water that issues from the well, 675 feet below the surface, that was struck by a company in boring for gas. Everybody uses it and everybody is well; and I am positive that since that well started there is less sickness with a larger population than before with a smaller population. And now Doctor, I have given you all the information in my possession that bears at all on the public health and I trust that my tenure in office, and behaviour while there, will be satisfactory to you."

IS IT RIGHT TO REMUNERATE POOR PEOPLE FOR CLOTHES, ETC., BURNED WHERE CASES OF DISEASES DANGEROUS TO PUBLIC HEALTH HAVE OCCURRED?

Aug. 7, 1889, Dr. A. E. Anderson, health officer of Iron Mountain, wrote to this office as follows:

"I am instructed by the common council to request of you information as to whether it would not be right to remunerate poor people for clothes, etc, burned where cases of disease dangerous to public health have occurred.

* Proper precautions were reported to have been taken by the attending physician. [H. B. B., Sec'y.]

"Would it be proper for the county to pay the owner for such clothes or would it have to come out of the city treasury?

"Has the owner any legal claim, or would it be entirely optional with the authorities?

"In the instructions to the health officer it says that he is to see that no one suffers for want of a nurse or attendant. Who is to pay for such nurse, the county or city?

"Is the health officer authorized to engage a nurse for cases where the patient is too poor to employ one?"

In reply to this letter the Secretary wrote to Dr. Anderson Aug. 12, 1889:

"I send you herewith a pamphlet (Prevention and Restriction of small-pox) in which I have marked paragraphs from which you will see that 'nurses and other assistance *and necessaries*' are at the charge of the county, where the person sick or those liable for his support are not able. I have also marked the decision of the Supreme Court that the board of supervisors must pass accounts audited by the local board, and cannot refuse on the ground that the patient was able to pay. The board of health is 'authorized to engage a nurse for cases where the patient is too poor to employ one' and the city is immediately liable for the pay. However it ultimately comes from the county. It would be perfectly proper to remunerate poor people for the clothes burned. This has been done in some cities. I think it was done at Flint some years ago in the case of small-pox. I think the courts would sustain a claim for such remuneration; but I cannot say that the law expressly provides for it."

AVERAGE DURATION OF TYPHOID FEVER.—FATAL AND NON-FATAL CASES.

From the following table it may be seen that of the 163 males who were reported to have died from typhoid fever within the three years 1887–9, and of which the interval between the day of being taken sick and day of death was given, the largest per cent died in the two periods from the 15th to the 20th and from the 20th to the 25th day of sickness, and that 55 per cent were sick twenty or more days before they died; while of the 116 females reported as having died in the same time, 24 per cent died before the tenth day, and that only 40 per cent were sick longer than nineteen days.

The average duration for the fatal cases was, in males, twenty-three days, and in females, nineteen days.

TABLE 3.—*Exhibiting by Sex of patient, the Average Duration (in days) of Fatal cases of sickness from Typhoid fever, in Michigan, during the three years, and during each of the three years 1887–9. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Fatal cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per Cent of Deaths in each Period of Days.											
			All Cases.	Under 10 days.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 55	55 Days and over.
1887.	Males	81	100	10	7	15	21	16	11	12	2	4	1	0
	Females	32	100	31	19	19	16	6	3	0	0	6	0	0
1888.	Males	40	100	20	13	18	23	10	8	0	5	3	3	0
	Females	33	100	24	21	15	12	9	6	3	0	0	9	0
1889.	Males	42	100	17	14	19	7	14	5	7	2	7	0	7
	Females	51	100	18	24	14	16	10	2	6	2	2	0	8
Av. 1887-9.	Males	163	100	16	11	17	17	13	8	6	3	5	1	2
	Females	116	100	24	21	16	15	8	4	3	1	3	3	3

In the following table (4) it may be noticed that the duration of sickness in *non-fatal* cases of typhoid fever for the three years, 1887-9, was about the same for both sexes; 60 per cent of the males and 62 per cent of the females recovered before the thirty-fifth day of sickness. The average duration was:—males 33 days, females 32.5 days.

The average duration of all cases, fatal and non-fatal, was:—males, 28 days, females, 25.75 days; and for all cases of both sexes, 26.87 days.

TABLE *4.—Exhibiting by Sex of patient, by per cent of cases which recovered in specified periods of time, the average duration (in days) of Non-fatal cases of sickness from Typhoid fever, in Michigan, during the three years and during each of the three years 1887–89. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Non-Fatal Cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per Cent of Cases in each Period of Days.											
			All Periods.	Under 10 Days.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 55	55 Days and over.
1887.	Males	203	100	0	5	6	12	16	18	15	9	6	3	8
	Females	158	100	0	9	9	19	12	17	11	6	4	3	9
1888.	Males	164	100	1	4	13	9	13	15	9	10	9	9	7
	Females	111	100	0	2	7	14	15	15	19	4	8	10	8
1889.	Males	166	100	2	7	13	14	16	14	12	9	6	2	5
	Females	165	100	6	8	9	14	19	12	11	8	4	2	7
Av. 1887-9.	Males	533	100	1	5	11	12	15	16	12	9	7	5	7
	Females	434	100	2	6	8	16	15	15	14	6	5	5	8

AGE OF OCCURRENCE OF TYPHOID FEVER.

In studying the following table, relative to age of persons who have typhoid fever, it should be borne in mind that there are more persons living at the earlier ages than at the more advanced ages. After the publication of the census of 1890 it will be possible to compare the following table with a table exhibiting the per cent of persons living in each period of age, and thus complete the study here provided for by this statement of facts relative to over one thousand seven hundred cases of typhoid fever.

TABLE 5.—*Exhibiting, by Sex of patient, the Age of persons reported sick from Typhoid Fever, in Michigan, during each of the three years, 1887–89, and the averages for the three years. Also the Average Age, and the Number of cases, in which the age was stated, reported in each of the three years.* (*Compiled from reports of those cases in which the Age was stated.*)

Year.	Sickness from Typhoid Fever.	Average age. Years.	No. of cases included in this table.	Age,—In periods of Years. Per Cent of Cases in each Period of Age.										
				All Ages.	Under 10 years.	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 Years and over.
1887.	Males	24	315	100	10	10	14	20	17	9	8	4	2	4
	Females	22	245	100	17	10	20	15	10	10	5	4	3	5
1888.	Males	24	310	100	12	13	15	20	11	11	5	4	3	6
	Females	23	199	100	12	22	20	14	8	5	4	6	3	7
1889.	Males	24	362	100	13	11	17	25	10	8	6	3	2	6
	Females	23	310	100	16	17	20	12	8	7	7	4	4	5
Av. 1887-9.	Males	24	329	100	12	11	15	22	13	9	6	4	2	5
	Females	23	251	100	15	16	20	14	9	7	5	5	3	6

TWO LINES OF EVIDENCE OF THE PREVALENCE OF TYPHOID FEVER.

In studying the prevalence of typhoid fever in 1889, from the facts presented in the preceding and following pages, it must be borne in mind that those facts are derived from two distinct sources of information:

1.—The numbers of outbreaks, of cases of sickness, and of deaths from typhoid fever are taken from special reports from health officers and other township, city and village officers, during the course of an outbreak, at its close, or in special reports at the close of the year. If all the people and officers report as the laws provide, the facts presented should represent the *actual numbers* of outbreaks, cases of sickness, and deaths from typhoid fever. It is just to state that, as the people generally are becoming better instructed in the measures recommended by the State Board of Health for the saving of life and health, better and more complete reports are made year by year. So, each year, we believe that an increasing proportion of the cases of sickness and deaths from the dangerous communicable diseases are reported to this office. This tends towards an apparent increase in the prevalence of the disease each year, modified, of course, by the real fluctuation in prevalence. While waiting for perfect reports, the facts derived from those now received are valuable for purposes of study.

2.—The prevalence of typhoid fever, or of any given disease, as indicated by the "per cent of reports" is taken from the weekly postal-card reports from regular correspondents of the State Board, health officers of cities and villages, and others. The "per cent of reports" is the per cent of the whole number of reports received which stated the presence of the disease named; it gives the relative prevalence of the disease, under the observation of the physicians who report. It may represent the relative area of prevalence of the disease, combined with the relative number of weeks the disease continued where it did occur, *but not the actual nnmber of cases.*

TABLE 6.—*Exhibiting the number of Inches of Earth above the ground water in Lansing, by months for the years 1886, 7, 8 and 9, compared with the per cent of reported cases and outbreaks of Typhoid Fever in Michigan, for each month: also the total number of cases and outbreaks reported for those years. (Compiled from those cases of which the date of occurrence was given; and from those outbreaks of which the time of beginning was stated.)*

Specifications relative to ground water and Typhoid fever.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	No. of cases and outbreaks included in this table.
Inches of earth above the water, year 1886	.....	276	278	274	272	273	277	282	287	287	286	291	294	.....
Per cent of cases of typhoid fever reported, year 1886 *	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Per cent of outbreaks which began in each month, 1886	100	6	4	4	2	2	4	11	15	26	11	11	5	253
Inches of earth above the water, year 1887	.....	296	287	280	282	285	288	290	291	291	294	297	294	.....
Per cent of cases of typhoid fever reported, year 1887	100	2	1	1	1	2	3	8	20	24	19	12	7	1,096
Per cent of outbreaks which began in each month, 1887	100	5	2	2	3	6	4	12	23	20	11	9	3	289
Inches of earth above the water, year 1888	.....	292	298	294	293	293	293	293	290	293	297	294	300	.....
Per cent of cases of typhoid fever reported, year 1888	100	5	3	2	3	3	4	7	13	18	23	11	9	609
Per cent of outbreaks which began in each month, 1888	100	7	5	3	3	4	6	12	15	16	15	6	7	265
Inches of earth above the water, year 1889	.....	298	304	304	302	304	299	299	302	305	308	311	312	.....
Per cent of cases of typhoid fever reported, year 1889	100	1	2	1	2	1	2	4	12	28	24	15	7	1,248
Per cent of outbreaks which began in each month, 1889	100	4	2	3	2	2	5	8	17	21	19	11	6	882

* The per cent of cases in each month was not computed in 1886.

The weekly card reports, however, furnish a valuable means of ascertaining, approximately, the relative prevalence of the several diseases in a given year, and the relative prevalence of a given disease in one year compared with other years, and it is as good a scheme for ascertaining the facts as is yet available. Therefore the sickness statistics based upon those weekly card-reports should be relied upon for a comparison of the relative prevalence of typhoid fever in 1889 compared with preceding years. However, the evidence from the two sources may well be compared.

A comparison of the evidence from the two sources, just mentioned, relative to typhoid fever during the years 1886–9, is facilitated by the following exhibit:—

EXHIBIT 1.—*By years for the Five Years 1885–1889, the Per cent of Reports (from regular correspondents to the State Board of Health, and others) Stating the Presence of Typhoid fever in Michigan, also the numbers of Outbreaks, numbers of Localities of Outbreaks, the Cases of Sickness and the Deaths from Typhoid fever for the Same Years.*

YEARS.	Per cent of Weekly postal Reports Stating the Presence of Typhoid fever.	Reported Outbreaks of Typhoid fever.	Reported Localities of Outbreaks of Typhoid fever.	Reported Cases of Sickness from Typhoid fever.	Reported Deaths from Typhoid fever.
1885	8	218	200	715	194
1886	8	290	282	1,194	282
1887	10	335	320	2,424	411
1888	10	316	296	*1,511	310
1889	10	432	396	2,580	402

* Inasmuch as it appears that the reported outbreaks and localities in which typhoid fever occurred in 1888 were not very much less than in the preceding year, and were even more than in the year 1886, it is possible that in 1888, the outbreaks of typhoid fever were not allowed to spread as much as in previous years.

THE RELATION OF SICKNESS FROM TYPHOID FEVER TO THE RAINFALL, TO THE GROUND WATER,† AND TO THE HEIGHT OF THE WATER IN WELLS, IN MICHIGAN.

Typhoid fever differs in its mode of spread from some of the other dangerous communicable diseases. It is now most generally believed to be spread by a specific "germ," which is reproduced in the intestines, being conveyed from the bowel discharges of a victim of the disease to the alimentary canal of the second victim. Probably the most usual mode of conveyance for these "germs" is the contamination of the water-supplies by the fecal matter from those sick with this disease. The contamination of the water-supplies, and the virulence of the infected water seem to depend largely on the amount of rainfall and the consequent amount of water in wells which supply water for culinary and drinking purposes. A discussion of this subject from the evidence then collected, was printed in the Report of this Board for the year 1884, pages 88–114. Further evidence has been collected and is presented in the following tables and diagrams.

† It now appears that the fluctuations in the level of the water in the wells from which water is drawn daily are not the same as in wells from which no water is drawn, and which, therefore, show more accurately the level of the ground water.

TABLE 7.—TYPHOID FEVER IN MICHIGAN.—*Average per cent of weekly card-reports stating the presence of Typhoid Fever, by Year and Months for the Ten Years, 1878-87, also in each of the years 1885, 1886, 1887, 1888, and 1889.*

Period of Time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs. 1878-87*...	12	10	9	7	5	5	5	7	14	20	22	20	14
1885.....	† 8	11	7	5	4	3	5	5	6	11	13	16	8
1886.....	† 8	6	3	4	3	5	4	5	13	16	16	13	10
1887*.....	10	6	10	4	3	3	4	8	14	22	18	15	11
1888.....	10	10	7	6	5	4	5	7	12	18	16	12	10
1889.....	10	8	5	3	3	4	5	5	12	19	25	19	12

*The figures in the line for 1887, and in the line for the average for the ten years 1878-87, in this table do not all exactly agree with those in the same lines in the table printed on page lvi. of the Report of this Board for the year 1888, for the reason that the table printed in the Report for 1888 was made before the cards were all compiled for the *year* and was taken from the compilation (of the card-reports first received) for the quarterly reports. The line, "Average 10 years 1878-87," included the data for the year 1887 and consequently is not exactly, although it is substantially, the same as in the above table.

†Since May, 1885, physicians have reported only the prevalence of diseases under their *own observation*. Previous to that time diseases which were *believed* to be present (under the care of other physicians) were so reported. This undoubtedly accounts for a part of the sudden decrease in 1885 and 1886 as compared with the preceding years.

Table 7 exhibits the average prevalence of typhoid fever in Michigan by year and months for the ten years 1878–87, and for each year 1885–89, as indicated by the weekly card reports made by regular observers. Table 8 exhibits the rainfall by months and years for the period of ten years, 1878–87, and for each year, 1885–89.

TABLE 8.—RAINFALL IN MICHIGAN.—*Average number of Inches, by Months, for the Ten Years 1878-87, also in 1885, 1886, 1887, 1888, and 1889.*

Period of Time.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878-87..	37.27	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
1885.....	35.82	2.70	.73	.58	2.47	2.30	6.01	2.52	5.82	3.75	3.08	2.90	2.14
1886.....	32.16	3.05	1.72	2.74	2.40	2.58	2.29	1.36	4.21	5.36	1.97	2.35	2.13
1887.....	29.82	2.27	4.47	1.18	1.54	2.25	2.76	2.46	1.98	2.84	2.48	2.10	2.55
1888.....	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89
1889.....	28.18	2.42	2.04	1.01	1.62	4.21	3.82	3.07	0.98	1.85	1.10	3.10	2.96

Table 9 exhibits the relation of low water in wells to sickness (as shown by the weekly card reports) and the reported deaths from typhoid fever in Michigan, for the eleven years, 1878, 1880–89. The facts presented in two lines of this table, low water in wells and sickness from typhoid fever, for a ten year period, are graphically represented in a diagram on page 256 of the Annual Report of this Board for 1889.

TABLE 9.—*Exhibiting, for Michigan, by Months, during the Eleven Years, 1878, 1880, 1889,* the Relation of Low Water in Wells, to Sickness from Typhoid Fever; also, the Reported Number of Deaths from Typhoid Fever.*

Month:	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. inches of ground above the water in wells†	193	188	184	175	176	179	196	201	208	214	209	206
Fluctuation from Max. Depth of water in wells	18	13	9	0	1	4	21	26	33	39	34	31
Sickness from Typhoid fever‡	11	9	6	5	5	5	7	13	20	21	18	13
Av. number of reported ‖ deaths from Typhoid fever	24	22	25	25	23	21	28	59	93	102	74	54

* The data relating to the sickness and the deaths from typhoid fever in the years 1878, 1880-89, were used in order to coincide with the same period for which the measurements of ground above the water in wells were already obtained.

† The year 1879 could not be included as, for that year, there was no station from which reports were received for the whole year. The stations used in the compilation of this line, and the years for which reports were received and compiled from each are as follows: Elsie, 1878; Thornville, 1880-1 and 1885-7 Hillsdale, 1880, 1884, 1887 and 1888; Mendon and Union City, 1880; Linden and Dearborn, 1881; Brockway Center, 1882 and 1883; Otisville and Woodland, 1882; Saginaw City, 1883; Kalamazoo, 1884 and 1888; Lansing, S. B. of H., 1885-88; Ann Arbor and River Raisin, 1886-88; Alpena, 1887-88; Otsego, 1887; Traverse City and Battle Creek, 1888; Traverse City, Lansing, Ann Arbor, Kalamazoo, River Raisin and Hillsdale, 1889.

‡ Per cent of weekly reports, from observers in different parts of the State, which stated the presence of typhoid fever.

‖ The data used in the compilation of this line were taken from the Registration Reports of Michigan.—Vital Statistics.

From January to April the fluctuations in the sickness from typhoid fever and the depth of the water in wells are nearly coincident. From May to July the increase in the sickness follows the decrease of the water with an interval of about a month. Thence to November the agreement of the two is very close. In November and December the relation between them is about the same as in the first month of the year. The maximum of sickness and the minimum of water are coincident in October.

The stations at which the measurements of water in wells are taken and the number of years which are available from each station are stated in the dagger (†) footnote at the bottom of Table 9, this page. The Office has been unable thus far to get accurate measurements of the height of water in wells for a long period of years from any stations in Michigan. This absence of extensive data is especially deplored when a comparison of one year with a series of years is desired, but in the averages for a series of years by *months*, the evidence is accurate and valuable.

It is believed that all the wells from which measurements of water are made for this office, except the well at Lansing, are used. The well at Lansing is in the capitol grounds, far enough from other wells so as not to be liable to be affected by the rise and fall of the water in other wells from daily use, and so would more nearly represent the gradual rise and fall of the *ground water* than would measurements in wells from which water is drawn. But it has been found, by long-continued observations and investigations, that the rise and fall of the typhoid fever is in much closer relation to the fall and rise of the water in wells in actual use than to the fluctuations in the well at Lansing.

TABLE 10—GROUND WATER.—*Inches of Earth above the Water—by Months for the five years, 1885-89, and for the last four months of the year 1884, and for each of the five Years, 1885, 1886, 1887, 1888 and 1889 at* **Lansing,** *Mich.—Well in the Capitol Grounds.*

PERIOD OF TIME.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1885-89	291	290	291	289	286	287	287	289	291	292	294	295	290
1884	.....	.....	.....	.....	.....	.....	.....	.....	.....	290	291	293	292
1885	284	288	289	292	280	281	279	282	283	282	285	281	280
1886	281	276	278	274	272	273	277	282	287	287	286	291	294
1887	290	296	287	280	282	285	288	290	291	291	294	297	294
1888	294	292	298	294	293	293	293	293	290	293	297	294	300
1889	304	298	304	304	302	304	299	299	302	305	308	311	312

Table 10 exhibits the height of ground above the water in the well at Lansing, by months and year for the five years, 1885–89. In table 12, the first line of the above table is used, with the average line in the following table (11), together with the average sickness from typhoid fever during the same years.

TABLE 11.—*Temperature of the Water in the Well at the State Capitol in* **Lansing,** *Mich., by Months for the Five Years, 1885-89, and the last four months of the year 1884.*

YEAR AND PERIOD OF YEARS.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. Five Y'rs, 1885-89..	48	50	47	46	46	47	48	48	50	51	51	51	50
1884	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	51	51	49
1885	47	49	47	43	42	46	48	47	48	50	50	51	45
1886	48	49	47	46	45	46	46	47	50	52	52	51	50
1887	48	50	41	42	46	47	48	49	51	50	51	52	51
1888	49	50	49	48	47	48	48	47	50	51	51	52	51
1889	50	50	49	49	48	49	49	50	50	50	51	51	51

TABLE 12.—*Sickness from Typhoid Fever in Michigan (as indicated by the Weekly Card Reports by all Observers) and the depth of Earth (in inches) above the Water in the Well, and the temperature of the water in the Well, at* **Lansing,** *Michigan, by Year and Months for the Five Years, 1885-89.*

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Typhoid Fever*	9	8	6	4	4	4	5	6	11	17	18	15	10
Inches of Earth above Water in Well	291	290	291	289	286	287	287	289	291	292	294	295	296
Temperature of water in Well	48	50	47	46	46	47	48	48	50	51	51	51	50

* *Per cent of all reports* received (from observers in different parts of the State) which stated the presence *of typhoid fever.*

From the above table (12) it may be seen that the relation of sickness from typhoid fever to the ground water, as represented by the depth of water in the well at Lansing, is not so close as that which is shown to exist between sickness from typhoid fever and low water in wells in Table 9, on page 249 of this report. It is still possible, however, that if we could obtain measurements of water in *unused* wells in the different localities whence the reports of typhoid fever are derived, or could we have a full and correct report of all cases of the disease which occurred in Lansing during the same period for which we have measurements of the well there, and before there was a general water supply in Lansing, comparison of those data might show the existence of as close affinity between low *Ground-water* and typhoid fever, as exists between typhoid and *low water in wells.*

TABLE 13.—*Exhibiting the Average Total Annual Rainfall at Stations in Michigan, The same for Lansing, the inches of Earth above the Ground Water at* Lansing, *the Inches of Water in an undisturbed Well at Lansing, and the Reported Sickness from Typhoid Fever in Michigan, as indicated by the per cent of all the weekly card-reports which stated the presence of Typhoid Fever.*

YEAR, AND PERIOD OF YEARS.	Av. Total Annual Rainfall at Stations in Michigan, in Inches.	Total Annual Rainfall at Lansing, in Inches.	Inches of Earth above the Ground Water at Lansing.	Inches of Water in an unused Well at Lansing.	Ground Water, higher (+) or lower (−) than the five years' Average, in Inches.	Av. Per Cent of all Weekly Card-Reports Stating the presence of Typhoid Fever.	More (+) or less (−) Sickness from Typhoid Fever than the five years' average.
Av. 5 Y'rs, 1885-89 ..	31.11	28.63	291	33	=	9	=
1885.....	35.82	34.51	284	40	+ 7	8	−1
1886.....	32.16	29.52	281	42	+10	8	−1
1887.....	29.82	30.08	290	34	+ 1	10	+1
1888.....	29.55	25.76	294	29	− 3	10	+1
1889.....	28.18	28.28	304	19	−13	10	+1

Table 13 is a summary of the facts presented in tables 7 and 8, with the addition of the facts relative to the height of water in the well at Lansing.

From the evidence given in this table (13) it appears that the prevalence of typhoid fever in Michigan, in 1889, was about the same as in the previous two years, 1887 and 1888; and slightly more than the average for the five years 1885–9. The rainfall, both throughout the State and at Lansing, was less in 1889 than in any other year included in this table, as was also the depth of water in wells. In this connection, it is proper to hold in mind the fact that the efforts of the State Board of Health, the issuing of leaflets, diagrams and other literature bearing upon the restriction and prevention of typhoid fever, have continued for a number of years, and there is reason to believe that the influence of that work is increasing; possibly, if it were not for that work, the typhoid sickness during 1889 might have been as much more than in the preceding years as it would be expected to be because of the lessened rainfall and the low water in wells.

WHOOPING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1889.

During the year ending December 31, 1889, there were reported to the office of the State Board of Health 2,694 cases* of sickness, and 41 deaths, from whooping-cough, in 139 localities; an average of about 19 cases per locality, and 1.5 per cent of the cases proved fatal. The disease was reported prevalent in 58 counties. The greatest reported mortality was in Monroe county, in which were five deaths in the month of February. February and July had the largest number of deaths—seven occurring in February and six in July. These reports would indicate an increase of 192 cases, and a decrease of eight deaths, compared with the reports for 1888. But for a comparison of the sickness by years, the reader is referred to the sickness statistics in a preceding part of this volume.

In 28 outbreaks the source of contagium was a former case, 48 health officers and clerks reported that the source of contagium was "unknown," 61 did not report on this question, 2 replied to the question as to the source of the contagium, that the disease was "epidemic."

Whooping-cough continues to be of more importance than small-pox to the people of Michigan, causing more deaths, and very many times as many cases of sickness. Still the people generally do not make much effort to restrict it.

AN OUTBREAK OF PNEUMONIA DUE TO EXPOSURE TO COLD.

Wm. J. Hare, M. D., health officer of Addison, Oakland county, reported an epidemic of pneumonia at Leonard, in the month of January, from which the following extract is taken:

"There seems to be an epidemic of pneumonia here. I have been called to see 16 cases this month."

A letter was sent from this office to the health officer, asking if those sick had been exposed to similar conditions of cold, or sudden change of temperature. Also asking for any information bearing on the epidemic.

In reply the following letter dated January 22, 1889, was received from Dr. Hare:

"DEAR DOCTOR: I can trace about ten of those 16 cases of pneumonia to similar conditions of exposure. Between Christmas and New Years there was a church social here, held in a church that has been built, of brick, since the cold weather came on, and has not been plastered yet. They put a fire in it for the first time that day, and it was in a terrible condition for a congregation to meet in, nevertheless there were over a thousand people there, and I believe half of them caught severe colds, and about ten cases of pneumonia as a result. The other six cases I cannot account for."

PNEUMONIA BELIEVED TO HAVE BEEN SPREAD BY CONTAGION.

On February 17, 1889, Dr. John V. White, health officer of Oscoda village, Iosco county, reported as follows:

"Pneumonia still predominates, very few fatal cases known, I consider it contagious here. Families exposed have taken it within three to four days."

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*Of these 2,694 cases, 793 were estimated, by local officers, as having occurred, in localities where not all cases were reported by householders and physicians.

TWO OUTBREAKS OF DYSENTERY IN MICHIGAN, IN 1889.

Dysentery at Stockbridge, Ingham Co.

In September, 1889, an outbreak of dysentery, of a very severe type, prevailed in Stockbridge, in which there were reported to have occurred 23 cases and eight deaths. It was also stated that the disease was carried to Ann Arbor.

G. A. Rowe, M. D., a physician residing at Stockbridge, wrote September 7, as follows:

"DEAR SIR:—We are having an epidemic of dysentery of a very severe type. It is confined to the village mostly. There have been eight deaths from this disease, up to the present; and there are, as near as I can tell, about fifteen sick at present; several of them nearly hopeless cases.

"A boy of about 13 years came here visiting and stayed about ten days; he went back to Ann Arbor, the 30th of last month, and now he is sick with the same trouble. Dr. Vaughan, of Ann Arbor, says he will never be any better.

* * * * *

"We would like to have you investigate the cause of this trouble. Many of the people unite with us in this request.

"We have no regular health officer here."

The following is a copy of the reply sent from this office September 9, 1889:

"Dear Sir:—Please accept cordial thanks for your letter concerning the very fatal epidemic of dysentery in Stockbridge. I have written the president of the village asking attention to the law which requires a physician as health officer, and urging the employment by the village of some thoroughly qualified physician in Stockbridge to stamp out the outbreak. I send you by this mail a pamphlet issued by this Board on the prevention of typhoid fever. It seems to me quite likely that in this instance dysentery may be spread and prevented in the same way as typhoid fever."

Below is given a copy of the letter sent to the president of the village, of Stockbridge, Mich.:

"DEAR SIR:—It is reported to this office that an epidemic of dysentery of a very severe type prevails in Stockbridge, and that there have been eight deaths, and are now about fifteen cases. It is also stated that the disease has been carried to Ann Arbor. The returns to this office show, that the law which requires every village to have a physician for health officer, is not complied with in the village of Stockbridge. I send you by this mail a pamphlet issued by this Board on the restriction of typhoid fever, and it seems to me that dysentery may be spread and restricted in the same way. I think your village should at once employ one of your best physicians to stamp out this outbreak.

"Any aid which this office can give, in stamping out this outbreak, will be very cheerfully granted. I hope to hear from you that prompt measures will at once be taken."

Dysentery at Norvell, Jackson County.

Dr. Duncan Hindman, health officer of Norvell, wrote September 30, 1889, of an outbreak of dysentery in his jurisdiction, as follows:

"How strict would you be with dysentery? Lots of it around us, and some here. Many of our cases have not been from home to catch it, and, living in the country, are isolated of course. We disinfect all discharges, etc., but do not restrict intercourse, as with some other diseases. Please advise and oblige."

The following is a copy of the reply, sent October 1, 1889:

"DEAR SIR:—In reply to your card of September 30, I send you herewith a copy of a pamphlet, issued by this Board, on the prevention of typhoid fever, and I think that about the same precautions should be taken in cases of dysentery. In addition to the precautions mentioned on your card, I would recommend the boiling of all drinking water."

Inasmuch as it now seems to be proved that there are sometimes to be found, in the dysenteric discharges, amœbas, which may be causative of the disease, it seems desirable and important in every outbreak to ascertain whether or not they are present. For this purpose, microscopic examination should be made; and it is said that, when amœbas are present, it is not difficult to find them in the small gelatinous masses in the fœces.

In case the drinking water is suspected of causing the dysentery, it should be boiled before it is drank. Samples of the water (unboiled) should be taken while the disease is being caused by it, and an effort made to learn whether or not it contains the amœbas.

Outbreaks of dysentery should be reported by local health officers to the State Board of Health.

GLANDERS IN MICHIGAN, IN 1889.

This disease in man is, practically, incurable. Generally it has been communicated to man from the horse. Though it occurs most frequently among those who by occupation about horses are most exposed to it, no one can be considered safe in a community where a glandered horse is permitted to live. Justice to humanity demands that in every established case of this disease in an animal, the animal be destroyed, and that every suspicious case be strictly and securely isolated.

During the year ending December 31, 1889, 68 cases of glanders and suspected glanders in the horse, and one case of supposed glanders in man, were reported in 13 localities in Michigan, as follows:

Bay City, Bay county, four cases in the city, and a number more in the surrounding country; Oscoda township, Iosco county, one case; Lowell, Kent county, 50 suspected cases; South Boardman, Kalkaska county, two cases; Dover township, Lenawee county, two cases; Newton township, Mackinac county, one case; Muskegon, Muskegon county, one case; Novi, Oakland county, two suspected cases; Benona, Oceana county, one case; Almer, Tuscola county, two cases; Unionville, Tuscola county, one suspected case; Decatur, Van Buren county, one case in a horse, from which, it is said, a man contracted the disease and died. The details are here given relative to each locality:

Glanders in Decatur, Van Buren County.

The Detroit *Journal*, September 19, contained the following item:

"James Lowrie, a prominent colored man of Decatur, died recently of blood poisoning. It is now claimed that it was contracted from a horse troubled with glanders, and the matter will be investigated."

On September 21, 1889, a letter was sent from this office to G. W. Mahoney, M. D., health officer of Decatur, Van Buren county, asking for the details concerning this case. Dr. Mahoney's reply was as follows:

"DEAR DOCTOR:—Your letter of the 21, regarding death of James Lowrie, is at hand. I know nothing about this case for he was not a resident of Decatur, his home being in Lawrence township."

No further report was received at this office in regard to this case.

Glanders at Bay City, Bay County.

September 16, 1889, the following letter was received from Dr. H. M. Gale, health officer of Bay City:

"I have been notified that there are a number of cases (of horses) affected with glanders in Bay City vicinity. What should be done in such cases? I understand from one Veterinary Surgeon, that there are four cases in the city to his knowledge; and a number more in the country. Would it not be well to authorize some Veterinary Surgeon to investigate and report?"

In reply to the above communication, a letter was sent from this office, from which the following extract is taken:

"All cases of glanders are now to be reported (as required by law) to some member of the Live Stock Sanitary Commission. The President is Hon. H. H. Hinds, Stanton, Mich. I have written to him giving the substance of your letter and it would be well for you to report it to him."

Glanders Alleged to be in Lowell, Kent Co.

The Evening News, Oct. 23, 1889, contained the following:

"Fifty cases of what is suspected may be glanders are reported as afflicting that many horses in and about Lowell."

Hon. H. H. Hinds, was immediately informed from this office of this supposed outbreak. Nothing more was learned in regard to it.

Glanders in Saline, Washtenaw County.

July 31, 1889, the following letter was received from E. S. Holmes, M. D., health officer of Saline.

"There is a case of glanders in a horse in the township of Saline, reported to me yesterday. I went to see it to day and put it in quarantine, pending the decision of the board."

As soon as information reached this office a letter was at once sent to Dr. E. S. Holmes, from which letter the following extracts are taken:

"The law now requires that all such diseases be reported to some member of the State Live Stock Commission, of which Hon. H. H. Hinds, of Stanton, is president.

"I should be glad to receive reports from you as long as the disease remains in your jurisdiction, inasmuch as it is a disease dangerous to man and therefore properly a matter of concern to this Board."

On August 14, 1889, another letter was received from Dr. E. S. Holmes, as follows:

"DEAR SIR:—Since the last report I sent you in regard to glanders, there was another case reported to me last Saturday. I went immediately to see the case and put it in quarantine. On Friday I had a letter from Mr. Hinds, stating he would be here officially on 13th, so I did not report the case. Yesterday we went and examined both cases. Case No. 1 we strictly quarantined till destroyed by owner, as it is suspicious but not altogether clear to the president, as the owner has only had the animal since May last and does not know any of the previous history. So he gave the horse into my charge, to watch developments and report any change that takes place. The main reason for these steps are that the owner is a poor man, and the horse (however valueless) would be a big loss to him at present, but he is quite willing to comply with anything that may be directed. Case No. 2 is merely a watery discharge from the nose, which is the only trouble we could find; we therefore took no action in the matter only to keep the animal under surveillance."

The following is Dr. E. S. Holmes' special final report:

"Cause unknown, as horse was bought in another township. There was but one case. The animal was thoroughly isolated, and is now, so far as known, entirely recovered. This animal was seen by Hon. H. H. Hinds, and left in his charge."

Glanders in Newton Township, Mackinac County.

The following telegram was received December 30, 1889, from M. Cassidy, health officer of Newton township:

"Send Veterinary Surgeon to investigate supposed glanders in this township."

On December 31, the following reply was sent from this office:

"In reply to your telegram, I would state that I showed the telegram to Dr. E. A. A. Grange, State Veterinarian. He cannot act except on the order of the State Live Stock Sanitary Commission, and the law now requires the reporting of all such diseases to that commission.

"I telegraphed your message to Hon. H. H. Hinds, President of the State Live Stock Sanitary Commission at Stanton, and you will probably hear from one of them, at once."

Later, on December 31, a letter was received at this office from M. Cassidy, health officer, that the animal had been killed by the owner.

Glanders in Novi, Oakland County.

March 8, 1889, the following letter was received from R. M. Johnson, M. D., health officer of Novi township:

"DEAR SIR:—You will see by the report blank, that there are suspected cases of glanders in my township; but as we, the board of health of this township, read the law, we don't know as we have any power to act as long as it is confined to the horse, as the law exempts horses and sheep. Now, what shall we do and who is the State Veterinary Surgeon of the Sanitary Commission? Please advise and oblige."

In reply to the above communication, a letter was sent from this office from which the following extract is taken:

"I would say that the name of the State Veterinarian is Dr. E. A. A. Grange, Lansing, Mich. The name of the President of the Live Stock Commission is Hon. H. H. Hinds, Stanton, Mich. The law requires all cases of glanders to be reported to some member of the Live Stock Commission. The act was amended in 1889, so as to include horses and sheep. I have communicated with the president of the commission. It would also be best for you to write to him."

Hon. H. H. Hinds, President of Live Stock Commission, replied that "the case will receive prompt attention."

Glanders in Muskegon, Muskegon County.

The following report was received at this office from H. C. Brown, health officer of Muskegon.

"I have to report to you a case of glanders in a horse, so diagnosed by C. E. Carr, Veterinary Surgeon. I have also communicated the fact to H. H. Hinds, President of Stock Commission, at Stanton, Mich."

Glanders in Dover Township, Lenawee County.

On May 8, 1889, Geo. W. Bailey, health officer of the township, of Dover, reported:

"One horse surely has glanders, another probably, and another exposed. They have been quarantined. Please notify State Veterinarian and Live Stock Commission, as we are not advised of their addresses."

A copy of the above letter was immediately transmitted to Hon. H. H. Hinds, President of the commission.

Glanders in South Boardman, Kalkaska County.

On March 20, 1889, a letter was received from R. N. Thompson, health officer of South Boardman, stating in substance, that a case of glanders had been reported to him, and that there was liable to be trouble as two veterinary surgeons differed as to whether it was a case of glanders, and writes "what shall I do about it? Please let me know by return mail."

He was informed that the law required the reporting of such cases to the President of the State Live Stock Sanitary Commission.

On May 8, 1889, S. E. Neihardt, M. D., then health officer of South Boardman, reported another case of glanders, in his jurisdiction. A letter was at once sent to H. H. Hinds, informing him of the facts.

H. H. Hinds, President of the Live Stock Commission, replied:—"Dear Sir:—Your communications of May 8 and 9, reporting supposed cases of glanders near Clayton, Lenawee county, and South Boardman, Kalkaska county, were duly received, and have already received the attention of the commission." But what was the result of the investigation, was not stated.

Glanders in Almer, Tuscola County.

John L. Kane, health officer of Almer, writes as follows:

"I have a horse quarantined here sick with glanders, have had him examined by our Veterinarian at Caro, he pronounces it glanders. Another reported to me to-day. These cases I do not understand. Please inform me what is to be done with them, or what is my duty in the matter?"

In reply to the above communication a letter was sent from this office from which the following extract is taken:

"The law requires notification of glanders to be sent to the State Live Stock Commission. The President of the commission is Hon. H. H. Hinds, Stanton, Mich. I have written him the substance of your letter, and I hope you will communicate with him at once. Glanders is an exceedingly dangerous disease, communicable to *man* as well as to animals, and prompt action should be taken by the local board of health to protect all persons from the disease."

Suspected Glanders in Unionville, Tuscola County.

On July 29, 1889, a letter was received from Charles Moe, V. S., of Unionville, as follows:

"Secretary State Board of Health, Lansing, Mich., Sir: Will you send the State Veterinary Surgeon here as soon as possible, as I think I have a diseased horse and would like to know what is the matter."

A letter was at once sent from this office to Charles Moe, V. S., informing him that the law required him to report to the State Live Stock Commission. A copy of his letter was also transmitted to Hon. H. H. Hinds, President of the Commission. The result of the investigation has not been learned.

Suspected Glanders at Benona, Oceana County.

The following letter dated June 8, 1889, was received from Thomas Brewer, health officer of Benona township:

"I wish for advice concerning my action as to a horse, running the commons, suspected of having the glanders. I have notified the owner to keep him upon his own premises, which he refuses to do. What

steps shall I take to compel him? Can I have the horse destroyed? If so, must I call in the services of a veterinary surgeon? If it is a case of glanders can the owner collect any damages from the town for its destruction? Please inform me how to act in the premises, and greatly oblige."

In reply, the following was immediately sent from this office:

"You cannot act in this case without instructions from your board, of which you are the executive officer. Rules should be adopted, by every local board of health, which will enable its health officer to act promptly for the restriction of glanders without waiting for the board to meet and take action.

"The horse should not be *killed* until it is reasonably certain that it has glanders or farcy. To determine this the best available veterinary skill should be employed. Not only the health officer, but the board of health and the State Sanitary Commission should be satisfied that it is really a case of glanders, or farcy, before that particular action is taken—the killing of the horse.

"Hon. H. H. Hinds, of Stantion, is President of the Live Stock Commission, he should be notified at once. Enclosed herein is a pamphlet.the marked portions of which relate to the restriction of glanders, and answer the questions you ask."

Glanders in the Township of Oscoda, Iosco County.

The following telegram was received February 9, 1889, from C. A. Friedlander, secretary of the township board.

"How shall we proceed to dispose of a case of glanders according to law."

A telegram was immediately sent to C. A. Friedlander requesting him to report to Hon. H. H. Hinds, Stanton, Mich. A letter of explanation followed, also a pamphlet, marked, from which could be seen that it is the duty of any person, who discovers, or suspects, that any animal under his observation is affected with glanders, to report such facts to the State Live Stock Commission.

HYDROPHOBIA (RABIES) IN MICHIGAN IN 1889.

During the year ending December 31, 1889, there were reported to the office of the State Board of Health, eight outbreaks, in as many localities, of hydrophobia or rabies, in which seven persons, nineteen sheep, nine dogs, three cows, three steers, two hogs, and one horse were attacked by the disease. Of these, one person and most of the animals mentioned were reported to have died.

Such details as could be obtained in regard to the outbreak in each locality from which the disease was reported, are given in the following accounts relative to those localities.

The *Detroit Journal*, May 15, 1889, said:

"A month and a half ago a mad dog ran amuck between Camden and Reading, and at or near Camden he bit a boy named Albert Mathias. Monday night the boy was seized with convulsions, and died of hydrophobia, yesterday, in great agony."

On May 16, a letter was sent from this office to Dr. W. A. Oliver, health officer of Camden, asking for information in regard to the foregoing. He replied, in substance, as follows:

"The boy was bitten on Sunday evening, April 9, for a day or two after he was bitten the wound pained him. Two weeks after the accident, the boy, to all appearances, was doing well and feeling in good spirits; but looked somewhat pale and weak, but not enough so to excite suspicion of anything serious

"Sunday morning, just five weeks from the day he was bitten, he commenced to have pain in his left arm, with a little fever, and anxious expression. Complained of creeping chills, and vomited very easy, but did not complain of nausea at any time. Next morning was very nervous, constant turning or moving about. Marked peculiar anxious expression, talked quick and nervous. expressed a great desire for

water, but said 'I can not drink.' Water was taken toward the bed; he immediately showed excitement.

"He lived about forty-eight hours from the time the pain commenced in his arm.

"No one knows anything about the dog whether he is dead or alive. I went to see a man named Frederick Kempson, who had a dog, bitten by a dog, that bore about the same description that young Mathias gave of the dog that bit him. Mr. Kempson said that on the thirteenth day after the dog was bitten he began to have spasms, and when offered water refused it, and would go into a fit soon after. He kept him chained up, and after he had a few spasms killed him.

"Three other dogs in the vicinity have been killed on account of having shown signs of hydrophobia."

Alleged Rabies in Tuscola County.

The *Lansing Journal* of December 10, contained the following item:

"The 9-year-old son of A. C. Thomas, living ten miles southeast of here, was bitten by a rabid dog Saturday evening. The father of the boy was also attacked by the animal, but he finally shot it. The boy was brought here Sunday and the efficacy of the mad-stone in the possession of D. C. Hostetter, tried. The stone adhered for one hour and twenty minutes, and it is thought no bad results will follow from the bite. This stone has been tried three times within the last month."

About May 15, the *Detroit Journal* contained the following:

"A disease which is supposed to be hydrophobia has developed among cattle, sheep, and hogs belonging to farmers living in Gilford township, Tuscola county. It is supposed a mad dog went through that section, and bit several head of stock. Frank Preston, lost 11 sheep, Frank Bonblet, two cows and another farmer an ox. The animals go mad and have to be killed."

Rabies in Handy Township, Livingston County.

Arthur S. Austin, M. D., health officer of Handy township, Livingston county, on April 15, 1889, reported as follows:

"A case of rabies occurred on the farm of Mr. Charles Gruielling, this township. Two children and several cattle and horses were bitten by a rabid animal. One steer has since died with all the symptoms of rabies, and two others are now sick."

A letter was sent to Dr. Austin, informing him that a letter had been sent to Hon. H. H. Hinds, President of State Live Stock Sanitary Commission reporting to him the substance of his letter:

A letter dated April 23 was received from Hon. H. H. Hinds, from which the following extract is taken: "I beg to state that the commission have taken such action, as to the destruction of some domestic animals, and the quarantining of others, as we hope and expect will prevent the further spread of the malady."

A letter, dated April 23, was received from Dr. Austin as follows:

"The people who were bitten by a rabid dog in this township, some time ago, have shown as yet no unfavorable symptoms. I am doing my best to guard the safety of the people, but am somewhat handicapped by not knowing of any similar cases. Any literature or instruction you can send me will be thankfully received.

"The cattle continue to come down; one being taken violently ill and was killed Sunday, April 21. I have ordered the milk from these cattle discontinued."

Rabies in Merritt Township, Bay County.

The *Evening News*, May 2, 1889, contained the following:

"Several head of cattle have been bitten by a mad dog which passed through Merritt township, the other day. Some sheep which were attacked by the animal Thursday butted themselves to death."

A letter of inquiry was sent from this office. The reply received from H. Blodget, health officer of Merritt township, was substantially as follows:

"There were eight sheep, three were dead, three were having spasms; they lived but a short time after spasms set in. Three head of cattle and one hog also died from the same cause."

Rabies in Exeter, Monroe County.

Dr. Lawrence Baldwin, health officer of Exeter, reported as follows:

"Hydrophobia has broken out among some cattle and hogs here, confined to one farm; started from a dog. The dog has been killed. One hog and one cow have died. What is my duty, if any, in the case?"

A letter was sent from this office informing Dr. Baldwin that the law required the reporting of rabies in *animals*, to some member of the State Live Stock Sanitary Commission, of which Hon. H. H. Hinds of Stanton, Mich., is President; also that hydrophobia or rabies is a "disease dangerous to the public health," and as such, comes under the laws which require such diseases to be reported to the health officer, and by him to this office, and which require the health officer and the local board of health to take prompt action for their restriction.

Rabies in Saginaw City.

On April 27, 1889, Dr. N. D. Lee, health officer of Saginaw City, reported substantially as follows:

"We have had a mad dog scare here, since the fore part of January last, many dogs have been bitten, and three persons and one horse; some of the dogs have gone mad and have been killed; no person, nor the horse, has gone mad. I have, by request of our mayor and a resolution of the board of health here, made an investigation, and reported it to the common council, and in consequence a very stringent dog ordinance has been adopted."

Supposed Rabies in Coldwater, Branch County.

The *Detroit Journal* of April 25, said:

"A mad dog was killed at Coldwater Sunday before he had inoculated any of the citizens."

On April 29, a letter was sent from this office to Dr. L. A. Warsabo, health officer of Coldwater, asking for the particulars of the case. From his reply, the following extract is taken:

"On April 21 a dog supposed to be affected with rabies tried to bite Mr. Chas. Johnson's child, but fortunately it was jerked into the neighbor's house before it was injured. The dog ran into Mr. Johnson's woodshed where he remained, snapping at Mr. Johnson, when he tried to open the door. So it was shot by Mr. Johnson. No one was injured by the dog so far as I can find out."

WHAT TO DO WITH AN ANIMAL SUPPOSED TO BE RABID.

When a person has been bitten by a dog supposed to be rabid, it is important that the fact be established, whether or not the dog is rabid. Because if it is known to be rabid, there may then be time to undergo preventive inoculation, or other treatment; while if the dog is proved not to have had rabies such trouble may be prevented, as also the extremely painful anxiety which otherwise would long continue. It is now believed to be possible to learn whether or not an animal is rabid.

A dog or other animal, supposed to be rabid, should be very securely confined, in such manner that it is not possible for it to bite any person. If the dog is rabid it will soon die. If it lives, that is proof that it was not rabid. If it dies, the first method of procedure is stated by Dr. Moyer, in

his letter which follows. Experts in this line of research are now able to learn, through inoculation of animals with a preparation of the brain or spinal cord of the suspected animal, whether or not an animal supposed to be rabid was really rabid. As suggested above, such information is sometimes extremely valuable.

Following, is the letter above referred to, received August 20, 1889, from Harold N. Moyer, M. D., 434 West Adams street, Chicago, Ill.:

"MY DEAR DOCTOR: In the last report (1888) of your Board one death is reported from hydrophobia. Will you kindly have your records looked up and let me know how many deaths have taken place from this disease, during the past ten years? I am at present working up the statistics of this fatal disease, and am seeking information. Could you suggest any means of getting reports from our large cities upon this point?

"What State boards of health could I interest in the matter? Any advice or suggestions will be thankfully received. We have established a laboratory, in connection with Rush Medical College, for the preventive inoculation of rabies after the method of M. Pasteur, which now seems to be on something of a scientific foundation, and would like the coöperation of health officers in aiding us in our work. One of the most obscure chapters in the history of rabies is the condition of animals said to be rabid. Unfortunately they are incontinently killed as a rule, and valuable opportunities are lost. We would suggest that any animal supposed to be rabid, should be securely confined, and if death takes place the medulla and adjacent portions of pons and cerebellum be removed, washed in water that has been thoroughly boiled, and then placed in a sterilized bottle, with glass stopper, containing pure neutral glycerine. A convenient way would be to expose the bottle containing the glycerine to a temperature of 300 or 400 F. in an ordinary bake-oven for several hours. Portions of medulla preserved in this way will remain sweet for months, and tests may be made to settle the all-important question 'was the dog mad?' The excellent and well organized sanitary service in your State encourages me to appeal to you in this matter.

"Hoping that you will pardon this intrusion upon your time, and will favor me with an early reply,

I am very truly yours,

HAROLD N. MOYER."

In reply to the above, a letter was sent, extracts from which are as follows:

"DEAR DOCTOR:—Your letter of Aug. 17, is before me, and I have read it with interest. I am glad to know that you are making a thorough study of the subject.

"Responding to your questions, somewhat in the same order as in your letter, I have had the reports of this Board examined from the organization of the Board, and I find only the one case of hydrophobia to which you refer, in the last report. This may be because the disease causes so few deaths in this State, compared with other dangerous communicable diseases, that very little attention has been given it by our Board.

"By this mail I send you three pamphlets, issued by this Board, each of which contains something on the subject. Dr. Duffield's paper is not in harmony with the paper by the president of this board, and I think that one of the tables in Dr. Duffield's article is taken from the Vaccination Inquirer—an anti-vaccination journal published in London, and in my opinion entirely unreliable.

"I think that the health officers of the large cities would respond generally if you would send circulars with a stamped return envelope. I think that the most of them would be willing to look up and write you the reported deaths during a series of years not too far back.

"In answer to your question as to the State Boards of Health likely to respond, I send you the proceedings of the National Conference of State Boards of Health, on pages 32-34 of which I have marked those States likely to respond.

"I note what you say about the incompleteness of the history of rabies because of the usual destruction of animals supposed to be rabid, and I see the reason for the confining of the animals. * * *

"In this State the Secretary of State collects the Vital Statistics, and I have had a clerk look through the published volumes of the same since 1877, and I find deaths from hydrophobia as follows:

1877, 1878, 1879 and 1880	none.
1881	one.
1882, 1883	none.
1884	one.
1885	one.
1886, the last report yet issued	none.

"It is possible that not all the deaths from hydrophobia are recorded, but if twice as many occur as reported the number is still small compared with those from such diseases as scarlet fever, diphtheria, and typhoid fever. That is the reason why we give so much of our attention to those diseases. I recognise the fact, however, that the disease which you are studying is one which causes very great suffering, and it is certainly very desirable that it shall be thoroughly studied.

"Anything which this office can do to contribute thereto will be very cheerfully done.

"Very respectfully,

"HENRY B. BAKER, *Secretary.*"

LUMP-JAW (ACTINOMYCOSIS) IN CATTLE, IN MICHIGAN IN 1889.

The Detroit *Evening Journal* of March 1, contained the following:

"Meat Inspector Peter E. Hirth, while at the Michigan Central cattle yards this morning, detected several animals afflicted with lump-jaw. He found that the animals had come from the west several hours before, and were en route to Boston. He telephoned these facts to the health officer. Health Officer Duffield said to the Journal:

"We have no right to interfere with meat in transit. Our jurisdiction commences only when such meat is offered for sale in Detroit. It is, however, within the jurisdiction of the State Live Stock Sanitary Commission. But, unfortunately, that body has not a resident member here, and, by Gov. Luce's suggestion, it last year discharged its local agent at this place. By the time information could reach the president the diseased animals would be outside of the State and on their way to the east. The Detroit authorities can do nothing in such cases.

"Last Saturday the *Evening News*, in its report of the meeting of the State Live Stock Sanitary Commission, said that the board stated that no case of lump-jaw had ever been detected in Detroit. John C. Sharp, a Jackson cattle breeder, read the statement and wrote to J. J. Woodman, of Paw Paw, president of the commission, for information. Mr. Woodman answered that the statement was not true, and that the commission had evidence that cattle afflicted with lump-jaw had been slaughtered in Detroit and sold for human food. Health Officer Duffield said:

"At least two cases of lump-jaw have been detected in this city. The first was the carcass of an animal sold in Detroit last year to a butcher who took it to Mt. Clemens. On the representations of the Detroit board of health, the meat was condemned and destroyed. The second case was a heifer which was brought from Fentonville to Detroit, and was examined at King's stockyards by Veterinary Surgeon Murray and myself, three months ago. The animal was slaughtered in my presence and the carcass sent to George Parker's rendering works."

The following communication was sent from this office to Health Officer S. H. Durgin, M. D., Boston, Mass.:

"The Detroit *Evening News* of March 1, states that several lump-jawed cattle were shipped from the Michigan Central stockyards at Detroit to Boston on the afternoon of March 1. By 'lump-jaw' I understand actinomycosis—a disease dangerous to man as well as animals."

The Detroit *Tribune* of May 25, 1889, contained the following item:

"Jackson, May 24.—A clearly defined case of lump-jaw was discovered here today by Food Inspector Reynold. The carcass of the animal had been mostly sold and consumed. The animal was raised in Jackson county, and meat dealers and consumers are considerably alarmed, fearing that the case discovered is not an isolated one."

TYROTOXICON POISONING IN MICHIGAN, IN 1889.

During the year ending December 31, 1889, one instance of poisoning by ice cream, in which nine persons were made sick, and one of poisoning by head cheese, in which six persons were made sick, have come to the attention of this office, as having occurred in Michigan.

It is well known that cases of severe illness sometimes follow the eating of ice cream, cheese, canned meat, head-cheese, etc. The symptoms usually produced are dryness of the throat, nausea, vomiting, purging, headache, double vision, abdominal pains, pain and cramps in the muscles of the arms and legs, coldness of the extremities, and feeble pulse. Prof. Victor C. Vaughan, of the Michigan University, worked out the common cause. After a long and close investigation, he succeeded in isolating from some samples of cheese which had produced the above-mentioned alarming symptoms in many persons, a highly poisonous substance, and he named it "tyrotoxicon." His work has now been verified by many chemists, and is known around the world. Whoever wishes to consult the original papers, in this line of research, can find them in the annual reports of this State Board of Health, those by Prof. Vaughan being on pages 154-164 of the report for 1886, and on pages 12-19 and 177-185 of the report for 1887. Prof. Vaughan's articles have been reprinted in pamphlet form.

The cases of poisoning during 1889, which have come to the notice of the office of the State Board of Health are as follows:

POISONING BY ICE CREAM, AT CHESTER, EATON COUNTY.

The *Detroit Free Press* of July 3, 1889, contained the following item:

"The town of Chester, Eaton county, has been the scene of considerable excitement. Last Sunday night the families of Jo. Enbody, and Robert Russell, nine in all, were taken severely ill from eating ice cream. Dr. F. A. Weaver, the attending physician, pronounces it tyrotoxicon poison. No deaths have occurred yet but several of the sick are now confined to their beds and in a critical condition.

A letter was immediately sent from this office to Dr. F. A. Weaver, asking for all the facts with which he was acquainted. Dr. Weaver writes, in substance, as follows:

"I was called on July 1, to see Mrs. Enbody, aged 22 years, who was taken sick during the night of June 30, with slight chill, followed with nausea and vomiting, severe griping pains in the bowels, followed with profuse watery discharges from the bowels, very severe pain in head and back, pulse 140 per minute, cold clammy sweat, eyes sunken, countenance pallid, a disposition to sleep, but the severe attacks of pain in bowels prevented her from doing so. Upon close inquiry as to the different kinds of food which she had eaten, I learned that they with Allen Lords' family had met at Robert Russell's, a neighbor, on the previous day, and had all eaten ice cream, and her symptoms led me to think she was suffering from tyrotoxicon poison. On Wednesday, July 3, after treatment, patient convalesced rapidly. Monday eve, July 1, 24 hours after the parties ate the cream I was summoned to the family of Allen Lords. Found Allen Lords, his wife, baby 18 months old, Susie 13 years old, and Nettie 15 years old, all suffering with all the symptoms as did Mrs. Enbody, except Mr. Lords, who had taken a large dose of pills, before my arrival, and was somewhat better. While I was at the house of Mrs. Lords, I was summoned to go to see Mr. Russell's family, three in all, whom I found suffering from symptoms similar to those above enumerated. Mrs. Robert Russell made the ice cream, and all who ate of it were taken sick the same day, from three to six hours after eating thereof.

"I was unable to obtain a sample of the cream for analysis, but learned that it was frozen in a tightly-covered tin pail and they were several hours in freezing it, the pail being one which was used for a milk pail. It is altogether probable that some milk might have remained in the seams inside the pail, and have become decomposed and in this manner infected the cream with the poison. These are only possibilities and not established facts."

POISONING BY HEAD-CHEESE AT MOTTVILLE, ST. JOSEPH CO.

John J. Sweetland, M. D., health officer of Mottville, St. Joseph county, reported substantially as follows:

"I was called at 8 P. M., December 1, to see Mrs. S., living two miles in the country, and found her vomiting freely, little griping, but much purging, great prostration, pulse feeble, great thirst, dizzy sensation in the head, and partial stupor.

"On questioning the family as to her diet during the day, and especially her supper, I was told that she had eaten just the same as the other members of the family; but not being satisfied I gave her an active emetic and found in the matter vomited, her entire supper consisted mainly of head-cheese, made only a few days before, and from which they had been eating every day with no evil effects.

"At 11 P. M., the same evening, I was called in great haste, and found five more (which was the whole family) in much the same condition in which I found Mrs. S., except that in the daughter and father the symptoms were more severe and prostrative, and the girl was in a semi-stupor. All had vomited except the two, and so I gave the father an emetic, but knew the daughter was too weak, so I used the stomach pump, and removed the contents, and here also found plenty of the head-cheese.

"Mrs. S. prepared supper nearly three hours before the family ate, and while doing so tasted of the head-cheese.

"The other members were all taken at the same time, three hours after Mrs. S.

"The head-cheese was in an earthen crock, and, thinking it contained too much fat, they boiled it up in the crock, skimmed off the oil, and then used it cold; and after eating their first meal they were all poisoned. The glazing on the inside of the crock is off, in a few places, and so is it not probable that the trouble came from the glazing on the crock?"

In reply to the above a letter was sent asking that—

"If the head-cheese has not been destroyed, will you have the kindness to send a quantity of it with the crock, or, if the crock is too large, a piece of the crock, showing the glazing, and also a piece with the glazing off? A piece that will show whether the glazing was cracked off or dissolved off will be best."

In reply to the above communication the following letter was received from Dr. Sweetland, health officer:

"DEAR SIR:—Yours of recent date received. Am very sorry, but the head-cheese has been destroyed. Also the crock; yet I obtained a piece of the head-cheese about the size of a hen's egg, and gave it to a cat, which in 12 minutes had vomited, in 30 had purging, also marked stupor, and recovery only after 60 hours.

"I saw one of the family last evening, was told that it was at least eight days before the head symptoms left, and also showed marked debility for some length of time."

ALLEGED NUISANCES IN MICHIGAN IN 1889.

During the year 1889, communications relative to alleged nuisances, were received at the office of the State Board of Health, from thirty-one localities in Michigan.

The causes to which the alleged nuisances mentioned in these communications were attributed, may be classified as follows:

Hogs fed on dead horses and other refuse, 2; unhealthful school-house, 1; cider mills, 4; unsafe and filthy buildings, 1; pollution of Grand River, 1; an old soldier who lives in filth, 1; decomposed vegetable matter, 1; foul drains, 2; hide store, 1; night soil and privies, 4; slaughter-houses, hog-pens, etc., 5; rubbish dumped on roads, 1; stagnant pools, 1; mill ponds, dams, and races, 3; vicious dogs, 1; saw-dust dumped into Pine River, 1; commercial fertilizers, 1; how near a cemetery is it safe to dig wells, 1; has a butcher a right to sell the beef of a cow killed within a month of calving, 1?

The following extracts from the correspondence of this office relative to

the above-mentioned alleged nuisances, show the nature of those nuisances, and the action taken, and recommended to be taken, in regard to them:

HOGS FED ON DEAD HORSES AND OTHER REFUSE MEAT.

Feb. 2, 1889, John R. Reynolds, Food Inspector for Jackson, Mich., wrote to the Secretary of the Board as follows:

"We have a case of feeding hogs here which is causing us a good deal of anxiety, and we are unable to tell just what steps are necessary to be taken in the matter. It stands about in this way. The hogs are fed on dead horses and all other refuse meat, and it is reported to us that these hogs are being sold for good meat. If this be so, what steps are necessary to take in the premises?

"Any information you can give us in relation thereto will be thankfully received.

"The worse feature about it is, that the place is outside of the city limits, and thus out of our immediate control."

In reply to this statement of facts, the Secretary wrote to Mr. Reynolds, Feb. 4, 1889, as follows:

"The law (§ 9816 Howell's Statutes) provides that any person who shall knowingly sell any kind of diseased, corrupted or unwholesome provisions, whether for meat or drink, without making the same fully known to the buyer, shall be punished by imprisonment in the county jail not more than six months or by fine not exceeding two hundred dollars.

"The *local board of health* is required by law to examine into all nuisances, causes of sickness, etc., and to prevent or abate them as the case may be. While the local board of health should not neglect its duty to make complaint,—if it does neglect or refuse so to do, anyone injured may do so.

"In all cases where there is not a plain, adequate and complete remedy at law the circuit court for the county, or the judge sitting in chambers has equity jurisdiction to grant injunctions to stay or prevent nuisances.

"You state that the feeding is outside of your jurisdiction. Will you have the kindness to inform me in what township it is?

In reply to the preceding letter from the Secretary, Mr. Reynolds wrote Feb. 6, 1889:

"In compliance with your request, to be informed in what township the hogs are fed the dead meat, I am pleased to do so.

"There are two places just north of the city limits, say about half a mile, and are supposed to be glue works, but the hogs are fed there and it is very credibly reported that after being fatted the hogs are sold for good meat.

"These hogs are kept in the township of Blackman, Jackson county, Mich.

"Thanks for information received from you."

March 21, 1889, Mr. Reynolds again wrote to the Secretary, as follows:

"Some time ago I wrote to you that hogs were being fed on dead horses, (just north of this city) and that the same were killed and sold for pork. Since writing to you I am fully satisfied that the facts are as I had stated. A few weeks ago these hogs commenced to die off. About this time the parties, to save the rest, had them killed, and I have good reasons to believe that they were shipped out of town with the other hogs.

"Now what I wish to know is, that in case I can prove beyond a doubt that these hogs were so disposed of, what steps are necessary to take to bring these parties to justice?

"What does the part of the law, which I have marked mean? Does the refuse of a distillery or of a brewery mean brewery grains?

"Is there a law in this State against the practice among butchers of blowing or inflating meat, and the sale of the same as an article of food?"

In reply to the foregoing letter, the Secretary wrote to Mr. Reynolds March 21, 1889, as follows:

"Please accept thanks for your letter of March 21. I do not see that you have taken any steps in accordance with my letter to you, dated Feb. 4, in which I referred to the law stating that in all matters

pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the Circuit Court of the county, or the Circuit Judge sitting in chambers has equity jurisdiction to grant injunctions to stay or prevent nuisances. Why not apply to your Circuit Judge for an injunction.

"I send you by this mail a reprint from the last Annual Report of this Board in which I have marked paragraphs (on pages 284-5) giving previous correspondence between this Office and the health officer of Jackson in regard to this subject."

UNHEALTHFUL SCHOOL-HOUSE AND SITE.

The following letter dated April 30, 1889, addressed to the Secretary, was received from J. M. Robertson, Supervisor and Chairman of the Board of Health of Clay township, St. Clair Co., Mich.:

"Enclosed I send for your perusal, reports which will speak for themselves—In Dist. No. 3, in this township—there exists a school difficulty. The school building is not large enough to accommodate the scholars—I believe the building will seat 54, and there are ninety persons of school age in the district—About evenly divided on a new site—The building is old and dilapidated having had no repairs for fourteen years—You see what has been done by the board of health. It is conceded by all that the present building must be enlarged and the people are divided, whether they will build a new school house on a new and better site, and of rebuilding on the old site—Of course this cannot concern you in any legal sense. But what has been done by the health officer and board has been done in good faith and what we wish to know is—Are we acting in accordance with law in our action? The one party has engaged a lawyer who, it is claimed says that he can upset all that the board of health has done, as they exceeded their jurisdiction and cannot condemn the site. Please look the matter up if you have to consult the Attorney General of the State. And let us know if we have the authority to do as we have done. If so it will stand. If not, we wish to do justice by rescinding our action. An early reply will be appreciated. I enclose copies of health officer's report and record of board."

The record of the action of the board of health and the health officer's report referred to in the above letter are as follows:

"April 11, 1889. It appears from the statement of J. M. Robertson, Supervisor and Chairman of board of health, that on the sixth day of April, 1889, George Shipman, Director, and Henry Kollman, moderator and members of the school board of school district No. three (3) in the township of Clay, St. Clair county, made a personal complaint to him, that the school house site, in said district, was in such a state as to be dangerous to the public health, and not fit for school purposes, on account of the same.

"Thereupon, W. K. Moore, M. D., the township health officer, was directed by said chairman to make an investigation and examine the said school building and site, and report his findings to this board as soon as practicable; and on the 8th day of April the said health officer filed his written report to this board setting forth that the complaint of the said school officer was well founded. * * *

"Therefore it was moved and supported that said site and school house be condemned for school purposes on the ground that it is dangerous to the public health, and that said school be closed and that the said school director be notified accordingly. Said motion was carried by a unanimous vote."

"Algonac, Mich., April 8, 1889.—Township Board of Health, Clay township.—

"GENTLEMEN:—I have this day made an inspection of the Point Tremble school house as per instructions from your board and beg leave to report as follows:

"*Site.* Low, damp and only about five rods from considerable body of dead water and marsh which has all the evidence of a malaria germinator.

"Water and mud surround the building at present and render it almost unapproachable.

"*Building.*—Wooden building 18x26 ft. with 9 ft. ceiling. This gives a seating surface of 468 square feet or only 7 square feet for each pupil. The present enrollment of the school being 65. The best sanitarians recommend at least 15 square feet for each pupil. The cubic capacity is 4,212 cubic feet, or only allowing 64 cubic feet of air space for each pupil. This is just four times too little air space. The best sanitarians recommend from 250 to 300 cubic feet for each pupil. This is demanded by legal enactment in Germany, Great Britain, France, Belgium, and in many cities and some States of our own country.

"There is no method of ventilation except by keeping windows open constantly, thus giving rise to dangerous draughts. The teacher and pupils complain constantly of headache, due to insufficient ventilation, the building is close to the ground, no provision made for circulation of air beneath.

"Water closet within twenty feet of building and cannot, in the present space allotted, be removed

further away. To enlarge the building to accommodate the present attendance would require it to be enlarged at least to double its present capacity. This would necessitate its extension over the present privy vault, which is neither desirable nor practicable.

"In conclusion, I wish to state that from a sanitary standpoint, I consider the present condition of the school a menace to the health of the pupils and a reproach to the best interests of the school district.

"Obediently yours,

"W. K. MOORE, M. D.,

"*Health Officer.*"

In reply to Mr. Robertson's letter, the Secretary wrote to that gentleman, May 6, 1889, as follows:

"DEAR SIR:—Your letter and copy of the health officer's report, and the record of the proceedings of the board of health of Clay township, relative to a school house and site alleged to be dangerous to health, have been carefully read.

"Section 1640, Howell's Statutes, says: 'The board of health shall examine into all nuisances, sources of filth and causes of sickness that may, in their opinion, *be injurious to the health of* the inhabitants within their township, or within any vessel within any harbor or port of such township; and the same shall destroy, remove *or prevent* as the case may require.'

"This would seem to give authority to the local board of health to take the action taken by your board; but it must be borne in mind that declaring a thing to be a nuisance does not make it a nuisance if it is not one in fact. (*Van Horn vs. The People*, 26 Mich., 221, 226). If, in this instance, the order of your board of health is not obeyed, or its legality is questioned, I would advise that your board go before the Circuit Court or to the judge sitting in chambers, and ask for an injunction to stay or prevent the alleged nuisance; taking this action under Section 7965, Howell's Statutes, which gives the Circuit Court *equity* jurisdiction in all matters concerning nuisances where there is not a plain, adequate, and complete remedy at law.

"Herewith I send you a four-page pamphlet 'Petition for Abatement of Alleged Nuisances,' in which you will find a discussion of the subject.

"I shall be glad to learn what action is taken, and with what result."

CIDER MILLS AS ALLEGED NUISANCES.

May 9, 1889, a resident of Matherton, Ionia Co., wrote to the Secretary of this Board complaining of unpleasant odors, smoke, cinders and other evils emanating from a cider mill near his residence, and asking what steps it was necessary for him to take in order to have the alleged nuisance abated. In reply to this correspondent the Secretary, under date of May 11, 1889, wrote as follows:

"I send you enclosed herewith an article entitled "Petition for the Abatement of Nuisances," in which the subject of nuisances and their abatement is discussed. I also send, by this mail, a copy to the president of the board of health of the township of North Plains.

"The State Board of Health has not the authority to order a nuisance abated; its powers in this direction are advisory. If this cider mill is a public nuisance, it is the duty of the local board of health to order its abatement; and if such order is disregarded, it becomes the duty of the board to enforce obedience by process of law. If the nuisance consists merely in the infringement of some private right, it falls upon the person injured to obtain redress from the person creating the nuisance.

"I should be glad to be kept informed concerning this alleged nuisance and such efforts as may be made for its abatement.

"You, will see by Section 6377, Compiled Laws of 1871, which is 7965 of Howell's Statutes, that the Circuit Court has equity jurisdiction in all matters relating to nuisances in which there is not a plain, adequate and complete remedy at law. *If this* is such a case, I would advise you to apply to the circuit court, or to the judge sitting in chambers, for an injunction to stay or prevent the nuisance."

Another correspondent writing to the Secretary from Middleton, Gratiot county, Aug. 29, 1889, stated that there was a cider mill near his residence the pomace from which had been thrown out, had become very offensive and was supposed to be cause of sickness in the neighborhood.

The health officer had ordered that said pomace be disinfected, but the owner of the premises had neglected to comply with that order. The writer asked the Secretary if anything could be done to compel the owner of the mill to abate the nuisance.

In reply to this correspondent the Secretary wrote Aug. 31, 1889, giving him all the information and advice necessary in the case.

The following letter, dated Sept. 12, 1889, and addressed to the Secretary of this Board was received from Henry A. Wells of Lawrence, Van Buren county:

"DEAR SIR:—I would enquire if the pomace from a cider mill and pomace from sorgum, also the cores and peelings of apples, would be considered as detrimental to health. I have such an institution as this on the lot adjoining me, the refuse from said drier and mill is thrown over the bank back of mill and left there to decompose and is very offensive, so much so, that those living on the street are obliged, as well as myself, to close doors and windows in consequence of these offensive odors. What course must the village council pursue to prevent this? Would you consider this detrimental to health? Or would it be a nuisance? If in either case, what would be the proper way to proceed to prevent the further accumulation of this pomace? If it is a nuisance and the village Board order the parties to remove the pomace and they fail to comply, what legal course should then be taken to find redress? If the board fails to do their duty in the matter could they be compelled to take action by an appeal to the Prosecutor of county

"Hoping you can give me some advice on this subject soon, I am sir

"Very respectfully,

"HENRY A. WELLS."

In reply to Mr. Wells' letter the Secretary wrote to him Sept. 14, 1889, as follows:

"In reply to your letter of Sept. 13, I would say that the pomace from a cider mill, might, under some circumstances, become a nuisance, and the local board of health is required by law to examine into all nuisances, sources of filth, etc., and prevent or abate them as the case may require. I send you herewith two pamphlets in which I have marked paragraphs bearing on such a case. If it is not certain that the alleged nuisance is a nuisance in fact,—that is, if there is not a 'plain, adequate and complete remedy at law' the safer course is to make complaint before the circuit court (or the circuit judge sitting in chambers) and secure a judicial order for the abatement of the nuisance. The local board of health should make this complaint. However, if the local board of health neglects to do so, anyone injured by the nuisance may make the complaint."

In regard to this alleged nuisance, Z. L. Baldwin, M. D., wrote to the Secretary Oct. 5, 1889, as follows:

"I wish your council regarding a questioned health nuisance of the town. There is a cider mill at the outer east limits of the town bordering on a marsh where the yearly quantity of pomace and sugar cane is dumped over a bank about twelve or fifteen feet into this marsh. The mass has been accumulating three or four years. There has been no typhoid, or other epidemic or endemic disease in that part of town, since it was put there. The odor from the cider and the pomace is sickening at times and affects two or three families. The nearest is about six rods from the pomace pile. There have been two complaints. I cannot see that the pile is dangerous to public health, as the drainage is good.

"Please give me your advice. Would or could we compel the firm to remove the pomace from the town? Does the Board consider such a thing a health nuisance? Do other towns have the pomace removed from the corporation? Would not the acid or alcoholic fermentation that takes place destroy the disease producing effects of the apples (such as would take place from apples rotting in a cellar)?

"These, with any other points of information, would add much to the pleasure or discomfort of a few of the 'roaring lions' of the village who choose to make the health officer the butt of their righteous (?) indignation."

In response to the preceding letter, the Secretary wrote to Dr. Baldwin, under date of October 11, 1889:

"In reply to your letter concerning an alleged nuisance, I send you herewith two pamphlets in which I have marked paragraphs bearing on the question you ask. While no specific disease might be caused from the pomace from the cider mill, the *local board of health* is required by law to examine into all

nuisances, sources of filth, and prevent or remove them as the case may require. The courts are very careful to respect the rights of all to air, uncontaminated by noxious odors, etc. In case there is any doubt about the alleged nuisance being a nuisance in fact, the safest course would be to make complaint before the circuit court or the circuit judge sitting in chambers, and secure an injunction for the abatement of the nuisance.

"The village council has, by law, discretionary authority to assign places for the exercising of trades and employments offensive to the inhabitants. I cannot say at this distance whether it is a nuisance."

UNSAFE AND FILTHY BUILDINGS.

May 22, 1889, Dr. Samuel E. Morgan, health officer of the village of Howard City, wrote to the Secretary of this Board as follows:

"We have a building that I am ready to condemn and have told the council the same. It is unsafe to stand and is a filthy place. Now the council of the village wishes to know how to proceed so as to leave no cause of action for damage. Is it necessary for the President of the State Board to inspect said building? If so, will the village have to pay him for coming up or will you send him here? Please inform me by return mail, that I may show your letter to our council at once."

In reply to Dr. Morgan's letter, the Secretary wrote to him, May 24, 1889, as follows:

"It is not necessary for the President of this Board to inspect the building in question, you do not give the details. I cannot tell whether it is a public building or not.

"I presume from your letter that this building is a nuisance. If it is, it is the duty of the local board of health to investigate, and if found to be a nuisance, they should order and enforce its abatement by process of law. When the law does not afford a plain, adequate and complete remedy, an application may be made to the circuit court, or to the judge sitting in chambers, for an injunction, to stay or prevent the nuisance.

"Enclosed I send you a pamphlet, entitled 'Petition for the abatement of an Alleged Nuisance,' in which the laws relative to nuisances are cited, and the subject fully discussed. I would be glad to be informed of the action taken by your board, and the result, and what is the trouble with the building."

ALLEGED POLLUTION OF GRAND RIVER BY THE CITY OF LANSING.

May 27, 1889, the health officer of Grand Ledge, Dr. W. A. Brower, wrote to the Secretary of the Board as follows:

"What are we going to do about this fish question? Some of the pests of Lansing have been putting something in the river which is killing all the fish. They lodge all along the shore, there to rot and stink. The shore is literally covered from here to Lansing. Please let me hear from you at once."

In response to the preceding letter, the Secretary wrote to Dr. Brower, May 29, 1889, as follows:

"Your letter relative to alleged pollution of the water of Grand River by people in Lansing, has been received and referred to the Lansing City Board of Health. I trust the Grand Ledge Board will promptly attend to the business. I send you pamphlets, relative to nuisances."

AN OLD SOLDIER LIVING IN FILTH.

The Secretary received the following letter, dated June 11, 1889, from John T. Kane, health officer of Almer township:

"I have a case on my hands here that I do not know what to do with. He is an old soldier, lives with his little boy alone, owns forty acres of land, gets pension of some twenty dollars a month, has small house, 'tis very filthy; he lives in this dirt constantly. Complaint has been made to me as health officer by his neighbors. Please tell me what is my duty in this case."

In reply to this letter, the Secretary wrote to Mr. Kane, June 12, 1889:

"In reply to your letter of June 11,—Herewith I send you a pamphlet—'Petition for the abatement of an Alleged Nuisance,' which contains information on the subject of your inquiry. The premises in question should be examined by the local board of health, and if found to be a nuisance, prompt action should be taken to abate it, in the manner described in the above mentioned pamphlet."

DECOMPOSED VEGETABLE MATTER.

The following communication, Dated June 13, 1889, and signed by a number of the residents of McDonald, Van Buren county, has been received by the Secretary of the State board:

"We the undersigned inhabitants of the above village in the Township of Bangor in the above County and State, deem it our duty both in our own individual interests and the well being of the general public in and around this vicinity, to call your attention to what may become a most serious matter as affecting the health of the neighborhood if not causing the actual outbreak of an epidemic. The circumstances are as follows:

"Last fall a Mr. William S. Charles who is a farmer owning a quantity of land around this place stored probably about 10,000 or 12,000 bushels of onions and a considerable quantity of potatoes in a large brick building close to the railway depot at this place. Owing to a failure of a market for this produce they were not removed from the storehouse, and are there at present in a state of decomposition. Mr. Charles has been requested from time to time to have them taken out and disposed of in such a way as to prevent any ill effects that might arise from their existence under present circumstances.

"These requests if not unheeded have been paid very little attention to. We have applied to the township authorities and the only effect produced is the introduction by Mr. Charles of a small quantity of Lime and Chloride of Lime into the building. This has very little effect and the state of things here in consequence of this nuisance is becoming unbearable, the air is poisoned for quite a wide area causing nausea to the stomach and the smell or rather stench is at times abominable, added to this is a pest in the form of a small fly generated by this decomposed mass of putrid vegetation, they are here in millions defiling our food and rendering our homes almost untenable. Unless there is a decisive move made in this direction by an authority that must be obeyed we fear the consequences may be felt by more than the dwellers of this little hamlet. There is unquestionably all the material at work to produce an epidemic of a serious nature and we beg of you to interfere in this matter for the benefit and safety of the community at large."

June 13, 1889, the Secretary wrote to the signers of the foregoing document, as follows:

"In reply to your communication of June 13, relative to an alleged nuisance.—Enclosed herewith is a pamphlet, which, if carefully read will indicate the proper action for you to take to abate this alleged nuisance, if it be a nuisance, as from your communication it would certainly seem to be. This Board has not the power to summarily abate the nuisance, but this office will cheerfully give you such advice and other help as will make it possible for you to act effectively for your own protection and for the good of the public health. It seems to me that what you describe is a public nuisance and should be promptly treated as such. The township board which is the board of health, should immediately investigate and take steps to have the nuisance abated. I will ask the attention of the township board to the subject at once.

"I would be glad to be kept informed of what is done, and the results. Enclosed is a stamped envelope."

June 13, 1889, the Secretary wrote to the health officer of Bangor informing him of the complaint which had been made in regard to this alleged nuisance, pointing out the duty of the local board in the case, and advising that prompt action be taken for its abatement.

On June 20, 1889, one of the signers of the above-mentioned petition, in accordance with the Secretary's request, wrote to the Secretary as follows:

"In accordance with your request to keep you informed of what is being done in the matter, I beg to acquaint you that the result of your letter to the township board was a visit by those gentlemen to the building in question and an order by them to Mr. Charles for their immediate removal. This has been commenced, but as only two men are employed to do it the probability is that at the rate per day the work

is being done it will of necessity take all the summer to accomplish it. In the meantime the nuisance instead of being got rid of with all the speed that such an exigency reasonably demands is rendered, if possible, still more offensive and of a more virulent nature, owing to the contents of the building being stirred up; and the doors and windows opened emitting a stench that is literally abominable, to say nothing of the swarms of flies that have been generated by the putrid mass. Several of our inhabitants have been obliged to send their families away to avoid, if possible, contagion that it seems certainly must arise from such a mixing of this foul air with that we breathe. There should be at least a dozen men set to work to remove the filth and bury it in as quick a time as possible, instead of two men who can barely make an impression on it in a day. Surely there is a law to compel immediate action in such a matter as this where the public health, not only of a locality, but possibly of a wide area of territory, is concerned. Mr. Charles may be acting so as to come within the bare limits of the law, in partially complying with the orders of the board by employing two men, thus commencing the work of removal, but this is not adequate to the occasion where human life is in danger. The law should insist upon action prompt and effective and thus prevent, if possible, the outbreak of an epidemic, the result of which it is impossible to estimate.

"With many thanks for your kind assistance, I am in behalf of the inhabitants. * * * *"

FOUL DRAINS AS ALLEGED NUISANCES.

A letter dated June 17, 1889, was received at this office, from A. Morehouse, a resident of Fenton, giving details in regard to a foul drain which was alleged to be a nuisance in that village, and asking information and instructions how to proceed to have said alleged nuisance abated.

In reply to Mr. Morehouse's letter, the Secretary wrote to him June 18, 1889, as follows:

"Your letter of June 17, addressed to the chairman of this Board is before me. The Secretary of this Board is its executive officer.

"In response I send you a copy of a 'Petition for the Abatement of an Alleged Nuisance,' in which you will find the laws and methods of procedure in such cases.

"The law makes it the duty of the local board immediately to investigate all nuisances, and to destroy, remove or prevent the same as the case may require. In case the local board of health fails, and in all cases where there is not a 'plain, adequate and complete remedy at law,' the circuit court has equity jurisdiction to grant injunctions to prevent or stay nuisances. This is provided for by section 7965, Howell's Statutes. If the circuit court is not in session the appeal should be made to the circuit judge sitting in chambers.

"I understand that a tile drain which is used also for the conveyance of storm water is being used in your village as a sewer and without any provision for the constant flow. I cannot see how this could possibly fail to become a nuisance.

"I shall be glad to know what is done in regard to the alleged nuisance."

June 26, 1889, Mr. Morehouse again wrote to the Secretary of this Board as follows:

"Yours of the 18th received. I presented the case fairly at the common council meeting Monday evening, 24th. The health officer reported that he had declared the out-house drain running into a storm sewer a nuisance. I read your letter, also the law quoted in the circular you sent me. The vote of the Board was unanimous in ordering the private drain taken up and instructing the village attorney to draft an ordinance with a penalty attached forbidding the tapping of the village sewers. Your letter with petition for abatement of an alleged nuisance was just what convinced everybody that the law was on my side. Please accept my thanks for your prompt assistance.

"Can you send me a copy of the powers and duties of local boards of health, if so I would appreciate it?"

July 9, 1889, B. Richards, health officer of Port Austin, wrote to the Secretary of the Board as follows:

"We have got into difficulty in attempting to abate a nuisance which has been caused by the obstruction of a natural water-course which causes a pool of stagnant water to remain within the limits of our village while the obstruction is outside the village limits, but within the township of Port Austin.

"Statement of the case as it stands: A petition signed by six or more residents of the village of Port

Austin was presented to the health board praying for the abatement of the nuisance upon the ground that it was a cause of sickness and dangerous to the public health.

"The health board proceeded to examine the so-called nuisance, and unanimously agreed and decided and declared it to be a nuisance and dangerous to the public health, and gave notice to the owner and occupant (different persons) to open said water-course, within twenty-four hours. Such not having been done and after waiting several days, the health officer who is the executive of the board (so I am informed) was directed by the board of health to hire men to go and open said obstructed water-course. This he did, but was obstructed in the work by the occupants who made threats and pushed some of the men from their work, threatening to shoot them, etc., etc., and the wife of the occupant proceeded to throw the dirt back in the ditch with a hoe. She was also the one who pushed one of the men from his work, while the husband intimidated one of the laborers so he went home and dare not enter upon the premises to work on the job.

"After a short time the men at work finding it no use to work as the earth was being thrown into the ditch stopped work to await the arrival of the owner, who, at once on his arrival forbid any of them from attempting to open said ditch or water-course, and threatened to prosecute the first man who would dare to move a shovelful of earth. This had the effect to frighten the men away. The men were upon the highway at this time waiting for the owner to arrive and did not again enter upon the land. Now it will be a difficult task to get men to go to work while they are exposed to threats and afraid of personal violence by the occupant and prosecution by the owner.

"The stagnant water is slowly drying up and we want to act upon this matter now; but our attorney is not quite clear on the subject. Please advise us as to our power and what to do or what we can do in the case. And also state what redress we have against those who interfere with the work, if any. * * *

"Please answer at once and send us what law you can on the subject."

In response to Mr. Richards' letter, the Secretary wrote to him July 10, 1889, as follows:

"I send you by this mail (enclosed) a pamphlet in which I have marked paragraphs from which you will see that where the destruction of private property is involved and the owner refuses to obey the orders of the local board of health, it is always safer to make complaint before the Circuit Court *or the Circuit Judge sitting in chambers*, and secure a judicial order for the abatement of the nuisance. In all matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the Circuit Court (or the circuit judge sitting in chambers) has equity jurisdiction to grant injunctions to prevent nuisances, or to stay them."

HIDE STORE COMPLAINED OF AS A NUISANCE.

June 29, 1889, H. M. Gale, M. D., health officer of Bay City, wrote to the Secretary of the Board as follows:

"There is a complaint from different parties of a hide store being a nuisance. It is located in a central part of the city but has adjoining it a livery barn and a saloon; and two saloons across the street. The medical men say they consider it *not* injurious to public health; only at times there are offensive odors about it. Can we as a board of health order it removed? The hides are brought in fresh and at once packed in salt; we do not allow him to put or unload any hides on the sidewalk; but still the saloon complains. Please give me your advice."

In reply to this communication the Secretary of the Board wrote to Doctor Gale July 2, 1889, the following letter:

"In reply to your card relative to an alleged nuisance I send you herewith a pamphlet in which I have marked paragraphs giving the proper course of procedure in the abatement of a nuisance.

"The local board of health is authorized by law to examine into all nuisances and prevent or remove them as the case may require.

"The law (Sec. 1678, Howell's Statutes) gives the mayor and aldermen of every city authority to assign places for the exercising of trades or employments offensive to the inhabitants.

"Where there is doubt as to a certain occupation being a nuisance, it is safer to make complaint before the circuit court or the circuit judge sitting in chambers, and secure a judicial order for the abatement."

NIGHT-SOIL AND PRIVIES.

July 19, 1889, H. W. Carey, health officer of Manistee township, wrote to the Secretary of the Board as follows:

"My attention has just been called to the fact that the city scavenger of Manistee city is hauling the filth from the privies, etc., of Manistee into our township and dumping it within a short distance of some of our roads. They are digging shallow pits and barely covering it. I shall serve them immediately with notice to stop and not allow any more of this inside the town limits unless it is done under proper regulations. What would you recommend for me to do under the circumstances if they should obtain permission from the owners of land in our town to dump this on their land? What regulations should they be required to observe in regard to transporting it and in regard to burying it so that it will not be a nuisance? I dislike to trouble you with a matter of this kind but do not see my way clear without your advice."

In reply to Mr. Carey's letter, the Secretary wrote to him July 22, 1889, as follows:

"I enclose herewith a pamphlet in which I have marked paragraphs bearing on the case.

"The regulations should be made by the local board of health and not by the health officer. These regulations should be published in some newspaper or posted in five public places. They should prohibit the dumping of filth anywhere except in a place specified by the local board of health. The regulations should specify a place where the filth would not wash or drain or filter into any well. The filth should be removed only in the day time, because there is usually no wind to drive away bad odors, or dangerous emanations, in the night, and should be buried not more than a foot and a half deep and not less than four inches under earth."

July 23, Mr. Carey again wrote to the Secretary expressing thanks for the information given him in the preceding letter and stating that the health officer of Manistee City had telephoned to him that the scavengers would not be allowed to haul any more filth inside of the township limits without proper arrangements having been made for the disposition thereof.

The following letter, dated July 19, 1889, was received by the Secretary, from Dr. W. E. Ward, health officer of Laingsburg:

"In the matter of Cooper, a hotel keeper here who keeps a slaughter house and pig pen within 40 rods of the depot, and who dumps his privy-draws there and who refuses to abate the nuisance, what are the steps necessary to compel him to do so? Should a written notice be given or is a verbal one sufficient? and how long previous to action against him should it be given? Also regarding repetition of the offense?"

In reply to this letter the Secretary wrote to Dr. Ward, July 20, 1889, as follows:

"I send you herewith a pamphlet in which I have marked paragraphs bearing on the case.

"The local board of health is required by law to notify the owner to remove a nuisance found on private property within twenty-four hours. The notice should be in writing, and if the owner refuses to obey the orders of the local board, the local board may cause the nuisance to be abated at the owner's expense. Of course if there is any doubt about the alleged nuisance being a nuisance in fact, it is safer to make complaint before the circuit court and secure a judicial order for its abatement. In all cases where there is not a plain, adequate and complete remedy at law, the circuit court for the county (or the judge sitting in chambers) has equity jurisdiction to grant injunctions to prevent or abate nuisances.

"If the slaughter-house is within twenty rods of any public highway it is a nuisance by statutory provision.

"The council of every village has discretionary authority to assign places for exercising employments offensive to the inhabitants and to fobid the exercise thereof in any other place."

July 29, 1889, Dr. Ward again wrote to the Secretary stating that the hotel keeper referred to in his previous letter had been arrested, taken before a justice and his examination set for some days later and asking if

they must wait until the matter was settled or whether they could go on the premises and clean it up at once. Dr. Ward also stated that the said hotel keeper had done nothing towards abating the nuisance, and asked if his liability increased for every day the nuisance remained.

To the preceding letter, the following reply, dated July 30, 1889, was sent to Dr. Ward:

"Where an owner refuses to comply with the order of the local board of health to abate a nuisance, the local board of health may at once cause the same to be abated at the owner's expense, but, as stated in the letter sent you before, if there is any doubt about the alleged nuisance being a nuisance in fact, it is safer to secure a judicial order for the abatement. It would be well to consult some attorney who is on the ground concerning the question which you ask.

This office will be glad to be informed of your success in abating the nuisance."

The following letter, dated Aug. 2, 1889, from Mr. Fred Ricker, health officer of Buena Vista, was received at this office:

"Thought I would write to you to find out my authority in a case of nuisance. There has been a person hauling out night soil and dumping it on a man's farm within 30 rods of five residents, and they made complaint to me about it, so I went down and ordered the man hauling it to stop drawing it, and also notified the owner of the farm to stop receiving it, and ordered him to cover it up by plowing the land. Neither one of them have paid any attention to me. Have I a right to prosecute them without calling a meeting of the board of health and what is the law in regard to that case?"

In reply to Mr. Ricker's letter the Secretary wrote to him Aug. 3, 1889, giving him all the information asked for, and sending him a pamphlet in which there were marked paragraphs bearing on the case. The local board of health (not the health officer) is required to act relative to all nuisances.

SLAUGHTER-HOUSES AND HOG-PENS.

A resident of Springport wrote to the Secretary Aug. 14, 1889, as follows:

"We have no health officer in our village and can not get anyone that will accept. Now who is the one to see to it? We have a hog-pen almost under our nose where hogs are fatted from slops of a creamery and it is very offensive. Please answer."

In reply to the foregoing communication, the Secretary wrote as follows, Aug. 15, 1889:

"I send you herewith a circular letter in which I have marked paragraph giving the law which requires every local board of health to constantly have a health officer. As there are several physicians in your village and as the law provides for calling a special meeting of the board there would seem to be no reason why your village should not have a health officer *if proper compensation is given*.

"I also send you a pamphlet in which I have marked paragraphs bearing on the question you ask concerning a hog pen which is an alleged nuisance.

"The local *board of health is* authorized by law to examine into all nuisances, sources of filth, and to prevent or remove them. If the owner refuses to obey the orders of the local board to abate the nuisance he is liable to a fine and the board may cause the nuisance to be abated at the owner's expense. However, if there is any doubt about the alleged nuisance being a nuisance in fact, the safer course is to enter complaint before the circuit court or the circuit judge sitting in chambers and secure a judicial order for its abatement."

Sept. 16, 1889, a correspondent wrote to the Board, from Dowagiac, Cass Co., stating that two slaughter houses situated in Pokagon township, within twenty rods of the city limits, emitted odors which were very offensive to the inhabitants of the neighborhood, and asking how to proceed to effect the abatement of the alleged nuisance.

Sept. 18, 1889, the Secretary wrote to this correspondent giving the information desired, and enclosing pamphlets with marked paragraphs bearing on the case.

A resident of the village of Oakley, Saginaw Co., wrote to the Secretary Dec. 2, 1889, as follows:

"An ice house was built within about three feet of my house and this fall they have converted it into a poultry and slaughter house. Now will you please advise me as to what course to take to have it removed as it is very disagreeable and dangerous to health?"

In response to this letter the Secretary wrote to said correspondent as follows:

"In reply to your letter of Dec. 2, * * * I enclose herewith two pamphlets bearing on the subject of nuisances, in which I have marked paragraphs concerning the question which you ask. As you will see, the statute prohibits under a penalty the maintaining of *any slaughter house within twenty rods of any public highway.*

"The *local board of health is required by law* to examine into all nuisances, sources of filth, etc., and prevent or remove them as the case may require. However, if there is any doubt about the alleged nuisance being a nuisance in fact, the better course is for the board of health to make complaint before the circuit court, or the circuit judge sitting in chambers, and secure a judicial order—an injunction for the abatement of the nuisance. The local board of health should make this complaint. However, if the local board of health neglects or refuses to make the complaint, any one injured or annoyed by the nuisance may make it.

"I shall be glad to be informed of what action is taken and with what result."

RUBBISH DUMPED ON THE HIGHWAY.

C. S. Whitmore, health officer of Lansing township, wrote to the Secretary of the Board July 29, 1889, as follows:

"Report has been made to me that a man has been seen dumping a large wheelbarrow load of back yard litter (consisting of old stove pipe, tin cans, wire screens, broken crockery, chips and boots and shoes) just outside city limits on Michigan avenue west.

"I do not know how to proceed, and cannot see that it comes within the power of the board of health unless it is under Sec. 4, so I wish to trouble you for your opinion and advice."

In response to this letter, the Secretary wrote to Mr. Whitmore Aug. 3, 1889, as follows:

"It would seem to me that the refuse you mention might come under section 4 of the regulations published by your board."

STAGNANT POOL ALLEGED TO BE A NUISANCE.

Aug. 21, 1889, A. E. Anderson, M. D., health officer and mayor of the city of Iron Mountain, wrote to the Secretary of the Board stating that there existed in a part of that city a stagnant pool which was believed to be the cause of typhoid fever, that a number of cases and some deaths from that disease had occurred in the vicinity of said pool, and that it had been declared a nuisance. In his letter, Dr. Anderson further says:

"The object of this letter is to seek your advice to find what immediate steps could be taken to cause the owners of the ground to fill up the pool. I have repeatedly brought the matter before the common council and at their last meeting a resolution was passed ordering owners to fill it up. The owners * * * refuse to comply with the resolution, although they fully agree that it is a source of danger to public health. The city has no money in its treasury, consequently cannot fill it up and sue the owners If the city should sue the owners to compel them to do it, it will take too long time. * * *

"It seems strange if there is no remedy if a cess-pool of such dimensions can remain in the center of a city with between 7,000 and 8,000 people.

"If I am not infringing on your valuable time, I beg for an early reply."

In response to Dr. Anderson's letter, the Secretary of the Board wrote to him Aug. 24, 1889, as follows:

"I send you herewith pamphlets, in one of which I have marked a paragraph bearing on the case. It seems to me that this is a case where the circuit court, or the judge, if court is not in session, should be asked for an injunction to stay or prevent the nuisance, under § 7965, Howell's Statutes."

Sept. 9, 1889, Dr. Anderson again wrote to the Secretary of the Board as follows:

"I am in receipt of your letter advising me to seek a remedy from the circuit court for the cess-pool of which I sent you photo? Our city attorney has advised me that a court of equity will take no notice of cases where there is a remedy prescribed by law, to-wit: Causing the owners to fill it up as was ordered by the resolution of which I sent you a copy. The notice was not complied with. It is now a week over the time given, and although I have urged upon the council the necessity of taking the matter into their own hands and cause the pool to be filled up and then sue the owner, no action has been taken. We have now had fifteen houses encircling the pool in which there has been this year, or is typhoid fever.

"Not a person in the city to my knowledge doubts but the pool is the cause of the disease, and yet I am powerless to get a remedy."

In reply to Dr. Anderson's second letter, the Secretary wrote to that gentleman Sept. 10, 1889, as follows:

"From your letter of Sept. 9, I infer that your city attorney claims that there is a 'plain, adequate and complete remedy at law' for the alleged nuisance. In this case it seems to me that the quicker the city authorities carry out this law which they are sworn to obey, the better it will be for the public health. However, if you find that there is not a 'plain, adequate and complete remedy at law' I would renew my suggestion that you or your board of health ask the circuit court, or the circuit judge sitting in chambers, for a judicial order for the abatement of the nuisance. I write to your mayor and council to-day."

Following is the letter written to the Mayor and common council, mentioned above:

"LANSING, Sept. 11, 1889.

"*To the Mayor and Common Council, Iron Mountain, Mich.:*

"GENTLEMEN:—The health officer of Iron Mountain has placed before this office the facts going to show that a pool of stagnant water in Iron Mountain, about which there are houses in which typhoid fever exists, is a nuisance. The facts go to show that this is the case. I infer that this is a case where there is a 'plain, adequate and complete remedy at law,' and it seems to me that the subject should receive *immediate* attention from the city authorities. In case, however, it is found that there is *not* a 'plain, adequate and complete remedy at law' I would suggest that complaint be made before the circuit court or the circuit judge sitting in chambers and an injunction secured for the abatement of the nuisance, under § 7965 Howell's Statutes."

"Very respectfully,

"HENRY B. BAKER,

"*Secretary.*"

In reply to the preceding letter, Dr. Anderson wrote to the Secretary, Sept. 16, 1889:

"I am in receipt of your letters to 'The Mayor and Common Council' and health officer regarding the cess-pool of which I have written you so much. The whole matter is now settled. I have purchased the hole, and the work of filling and disinfecting it will go on with the greatest rapidity."

MILL PONDS, DAMS AND RACES.

Aug. 29, 1889, the following letter from M. E. Whalen, M. D., health officer of Paw Paw, was received at the office of the Board:

"We have a very complicated case here to which I wish to call your attention and ask your advice. It is with reference to a so-called mill pond; having gone dry in consequence of a dam giving way. This

power has been the property of Thos. Stevens of Niles who formerly lived and operated a mill at this place. The mill having been destroyed by fire, the power has not been used by him since, he, however, having paid the taxes on the property ever since. The water having escaped about two months ago, there now remains a very unsanitary marsh of 20 acres within our corporation. We have asked Mr. Stevens to repair the dam and thus cover the surface once more. He now says he does not care to maintain the power longer, the land not being his, but the property of Mr. Grimps of this place; Mr. Stevens having procured the right to overflow it, Mr. Grimps says if the property comes back to him he does not care to have a dam there and will not allow one to be placed there. Now sir how are we to protect the public health? What steps can we take to render this property in the best sanitary conditions?

"The health of Paw Paw is certainly suffering in consequence of this malarial hot bed. Can we compel Mr. Stevens to rebuild, or Mr. Grimps? Or can they prevent us from placing a dam there and thus protect the public health?"

In reply to this letter the Secretary wrote to Dr. Whalen Aug. 30, 1889, as follows:

"I enclose herewith a pamphlet issued by this Board bearing on the subject of nuisances. I should say that this was a case which could only be settled by an application to the Circuit Court (or the circuit judge sitting in chambers). In all matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court for the county has equity jurisdiction to grant injunction to stay or prevent nuisances. This is a case concerning which you should consult your attorney."

Sept. 16, 1889, Dr. Geo. Martin, health officer of Litchfield, wrote to the Secretary as follows:

"Can parties owning mill site be prevented from frequently drawing down water in race (1 mile long) thus causing offense by exposure of large extent of muddy surface and large amount of organic matter? Parties complain and have good cause. Can he be restricted as to lowering of water, extent of surface exposed, etc.?"

In reply to Dr. Martin's communication, the Secretary wrote to him enclosing pamphlets bearing on the subject of nuisances, and giving him the information asked for.

The following letter, dated May 16, 1889, from V. S. Reynolds, clerk of the board of health of Howard City, was received by Dr. Avery, President of the Board and referred by him to the Secretary for reply:

"A petition has been presented to the board of health of Winfield, to have the dams removed from the Tamarac Creek in said township they being detrimental to public health. I was instructed by the Board of Health to consult the prosecuting attorney in regard to the matter, and he thinks it better that we confer with the State Board of Health. We wish to get your opinion before Saturday, May 18, as we have a meeting of our township board of health for that day, for that reason I telephoned you.

"Mr. Lisk, Supervisor of Reynolds, says: Tell Dr. that he wants council in regard to health matters too, so if you can come tomorrow it will be very satisfactory to all."

In reply to the above letter the Secretary wrote to Mr. Reynolds, May 18, 1889, as follows:

"Enclosed herein please find letter from Dr. John Avery, President of this Board, also a pamphlet entitled 'Petition for the Abatement of an Alleged Nuisance,' in which the subject of nuisances and their abatement is fully discussed. Please notice particularly the marked portions of the pamphlet.

"Will you have the kindness to keep this office informed concerning the measures which may be taken to abate this nuisance, and the results?"

A VICIOUS DOG ALLEGED TO BE A NUISANCE.

The following letter dated Oct. 2, 1889, from Dr. O. C. McDannell, health officer of Lowell, was received by the Secretary:

"I write for information and will state the case. One of our citizens keeps a large, vicious dog that has the reputation of being very wicked and he has demonstrated the correctness of the rating by attacking and seriously injuring a child on one of our streets a few weeks ago. Since then the dog wears a muzzle

or rather a strap around his mouth so that it is difficult to know without being close to him whether he is dangerous or not. He is allowed to run at large and the complaint comes to me that he attacks children on the street. His appearance and reputation are such that the fright is quite likely to be a serious matter. Have I, as health officer of the village, any authority to act in the matter?"

In response to Dr. McDannell's letter the Secretary wrote to him Oct. 4, 1889, as follows:

"I send you herewith a pamphlet in which I have marked paragraphs of interest in this connection. I also refer you to pages 808-811 of Wood's 'Law of Nuisances' from which you will see that the same rule prevails in regard to vicious dogs as in regard to other nuisances.

"However, the abatement of all nuisances rests with the local board of health and not with the health officer. I have marked paragraphs in the pamphlet sent you herewith from which you will see the powers of the local board of health in the abatement of a nuisance. *The Board of Health* is required to examine into *all nuisances* and prevent or abate them as the case may require."

SAW AND SHINGLE MILL REFUSE DEPOSITED IN PINE RIVER.

The following letter dated Oct. 21, 1889, was received by the Secretary, from M. B. Salter, Clerk, and N. J. Miller, Chairman of the Board of Supervisors of Gratiot county:

"Enclosed please find copy of petition presented to, and resolution adopted by the Board of Supervisors of Gratiot county, Michigan. Will you please take the necessary action in the premises?"

The petition and resolution mentioned in the above letter were relative to the depositing of refuse from saw and shingle mills in Pine River, which act and its consequences, were said to be deleterious to the public health; and encroachment on the rights of land owners along said river.

The action taken by the Secretary of this Board in regard to above-mentioned matter, is explained in the following letter, dated Oct. 22, 1889, and addressed to Mr. Salter:

"I send you herewith two pamphlets in which I have marked paragraphs of interest in this connection. This is probably a case in which an appeal must be made to the circuit court or to the circuit judge sitting in chambers to establish the fact that an *alleged* nuisance is really a nuisance in fact. If it is declared by the court to be a nuisance, a judicial order can then be secured for the abatement of the nuisance, an injunction from the court. The proper authority to make this complaint is the local board of health for the township of Sumner. However if the local board neglects or refuses to make this complaint, anyone injured by the alleged nuisance may do so. How would it do for the Board of Supervisors to have the subject brought before the Circuit Court?"

ARE ODORS ARISING FROM COMMERCIAL FERTILIZERS UNHEALTHFUL?

Oct. 31, 1889, W. L. Snyder, chemist at the Michigan Carbon Works, Detroit, wrote to Dr. John Avery, of Greenville, President of this Board, asking the following questions in regard to commercial fertilizers:

"Is the odor of commercial fertilizers injurious to health?

"By (commercial fertilizers) I mean that kind of fertilizing material that has been treated with strong sulphuric acid to make the phosphoric acid in the soluble condition, or to change the *tri-calcic phosphate* into the *mono-calcic phosphate*.

"Will not strong sulphuric acid destroy all organic disease germs?

"Is a *strong odor* or *stink* a disease *propagator?*

"A stink is *not* a *disease germ*, is it?

"Some of the most injurious gases, sewer gas, etc., (as far as health is concerned) have no odor, have they?

"Could typhoid fever germs come from a substance that had been treated with strong sulphuric acid?"

Mr. Snyder states his reason for asking the above-mentioned questions as follows:

"A physician in Ohio is trying to pass an ordinance to prohibit the use of commercial fertilizers in the city limits, and to prevent cars loaded with commercial fertilizers from standing more than 24 hours in city limits. This is supported on the ground that the odor of commercial fertilizers is injurious to health and that their odor and use, on the ground, would produce typhoid fever. As *chemist* here I have worked among fertilizers for three years and was never healthier in my life, and men who have worked at the factory twelve or more years have felt no injurious effects."

In reply to Mr. Snyder's letter, Dr. Avery wrote to him, Nov. 2, 1889, as follows:

"An offensive odor may not necessarily be unhealthful, to be a nuisance—it is sufficient if it is offensive—strong sulph. acid will destroy pathogenic germs.

"A 'stink' is a nuisance whether it produce disease or not; it may not contain disease germs; but the source whence it comes may be a good breeding place for them.

"I do not think that typhoid fever germs would originate in substances treated with strong sul. acid. I do not think commercial fertilizers applied to village or city lawns, in proper quantity, would produce disease. The storing of commercial fertilizers in any considerable quantity in a thickly populated portion of a village or city would be likely to prove a nuisance.

"For further information I have referred your letter to Dr. H. B. Baker, Sec'y State Board of Health, at Lansing."

Nov. 4, 1889, the Secretary wrote to Mr. Snyder, stating that he believed that Dr. Avery's reply to the above questions, covered the case.

HOW NEAR A CEMETERY IS IT SAFE TO DIG WELLS?

Oct. 21, 1889, Geo. D. Allen, M. D., health officer of the village and township of Portland, wrote to the Secretary of the Board, as follows:

"How near to the cemetery do you think it is safe to dig wells for domestic purposes?

"The soil in which the cemetery is located is a light sand, and the proposed location of the wells is between the river and cemetery."

In reply to Dr. Allen's letter, the Secretary wrote to him, Oct. 23, 1889, as follows:

"I enclose a pamphlet in which I have marked paragraphs from which you will see that the soil has been proved to be contaminated from a cemetery at a distance of thirty rods. In such a case as you mention I should hesitate to drink water without boiling, which came from a well at a much greater distance if the grade is toward the river, and there is not more certain drainage in some other direction.

"You probably remember the facts in the typhoid outbreak at Lausanne, Switzerland, where the cause of typhoid fever passed through nearly a *mile* of porous sand and gravel, and caused 130 cases of typhoid fever."

HAVE BUTCHERS THE RIGHT TO SELL THE BEEF OF COWS KILLED WITHIN A MONTH OF CALVING?

Dr. G. C. Havens, health officer of the village of Fowler, wrote to the Secretary, Oct. 22, 1889, as follows:

"One of our butchers here has bought a young cow that will calve in one month, and he is going to butcher her this week. Will he have a right to sell the beef?"

The Secretary wrote in reply to Dr. Havens' letter, Oct. 23, 1889, as follows:

"I would say that there is no specific law applying to the case which you mention. It would be a question of fact for the judge or jury whether it would come under § 9316, Howell's Statutes, punishing the sale of "any kind of diseased, corrupted, or *unwholesome* provisions."

CITY GARBAGE DUMPED JUST OUTSIDE CITY LIMITS.

Jan. 5, 1889, the following letter was received by the Secretary of the Board, from Charles S. Whitmore, Clerk of the township of Lansing, Ingham county:

"I am glad to call your attention * * * to a matter that has and does annoy our board of health and probably the boards of health in townships close around the larger cities throughout the state, very seriously.

"It is found to be a fact that grocers and dealers in perishable goods hire irresponsible parties to take away their spoilt goods. In nine out of every ten cases, it is estimated by our board this matter consisting of vegetables, meat market refuse, manure and other decaying matter is drawn just outside the city limits and thrown off close beside the road bed. There are hundreds of chances to do this when no one is watching, and though many complaints are entered we have been unable to bring any one to justice. As an incentive to people to watch and perhaps to the guilty to abstain from further offenses the Board ordered these reward notices posted throughout the township.

"I state these facts to you hoping, some day it will become a State affair."

The following is a copy of the reward notice mentioned in Mr. Whitmore's letter:

$5.00 REWARD.

The Board of Lansing Township will pay the above reward for information or testimony that will lead to the conviction of any party or parties of disposing refuse matter detrimental to public health or travel in any of the highways of Lansing Township.

CHAS. WHITMORE,

Dated, Lansing, Dec. 12, 1888. *Township Clerk.*

In reply to the above letter the Secretary of the Board wrote to Mr. Whitmore, Jan. 5, 1889, as follows:

"Please accept thanks for your notice of reward and for your letter relative to nuisances brought into your township from the city. I send herewith a marked copy of a pamphlet on the work of health officers, etc. Will you have the kindness to reply whether or not your board has made any regulations on the subject of nuisances, or on any other subject, and if so will you have the kindness to inform me of their substance? If your board has not made regulations, how can you punish anyone even though the cases may be reported to you? I mean under what law? It seems to me that the law is now sufficient if the local boards will act under it by making and publishing regulations. I infer from what you say about its becoming a "State affair" that you think the present law is not enough. If after looking the subject over you conclude that it is not sufficient, I would be glad if you would point out the reasons why and the nature of a law which in your opinion would be adequate. It would seem that it would save much time if a general law made and published "regulations" which most boards of health would be likely to make. Is that your view?"

Jan. 16, 1889, Mr. Whitmore again wrote to the Secretary, as follows:

"Please pardon the delay of this answer caused by waiting to get the opinions of the other members of the board in regard to your questions.

"We have no regulations nor can I find the record of any in the past except Slaughter House Regulations, copy of which I enclose. Your letter, for which I am very grateful, called attention to our lack of legal actions and prompts us to see that they are made legal before we get in any trouble. Our meeting for this purpose is called Jan. 22 and I will report to you the proceedings. Will also give my opinion and objections to present law then."

March 28, 1889, Mr. Whitmore again wrote to the Secretary of the Board as follows:

"In remembrance of the advice and aid you gave our board of health in preparing these regulations, I enclose a copy with an offer to send you more at any time if they will be of any use to you."

The Regulations referred to above are as quoted below:

REGULATIONS OF THE BOARD OF HEALTH OF LANSING TOWNSHIP.

1. No person sick with small pox, cholera, diphtheria, scarlet fever, or other communicable diseases; no corpse dead from any one of the above diseases or from any other communicable disease; and no article which has been infected or is liable to propagate or convey any such disease shall be brought within, removed from or conveyed through this township without the consent of the Board of Health.

2. No non-resident of Lansing township exposed to any contagious disease shall be kept or cared for within the limits of this township during the period of infection without the consent of the Board of Health.

3. No animal affected with an infectious or contagious disease shall be brought within the limits of the jurisdiction of this Board except by permission of the Board.

4. No house offal, dead animals *(or refuse of any kind)* shall be thrown in the highways or left exposed by any person, and no butcher, fish monger or vender of merchandise of any kind shall leave any refuse upon the highways or uncovered by earth within the limits of this township.

5. No person or persons, company or corporations shall be permitted to put in any of the streams within the limits of this township any dead animals, fish or meats or any rotten or decaying vegetables nor the contents of any privy or cess-pool.

6. No teacher in any public or private schools in this township shall allow any scholar or other person sick with any communicable disease or exposed to any communicable disease to attend school until the danger of giving such disease is passed except by permission of the Board of Health.

7. No person or persons shall convey within or through this township any swill or garbage between the 1st of May and 1st of November of each year, except in properly covered receptacles, and no person or persons shall keep or feed swine close enough to the dwellings and highways in this township to give injurious offensive odors to the residents of said township.

Violation of or a failure to comply with the provisions of this ordinance, or failure or neglect to comply with any of the requirements of the Board of Health, shall be a misdemeanor, and on complaint to a justice of the peace, be punished by a fine not to exceed ninety-nine dollars and costs; and in the imposition of any such fine and costs, the court may make a further sentence that the offender be imprisoned in the county jail of Ingham county until such fine and costs be paid, provided, however, that the term of such imprisonment shall not exceed the period of three months.

J. R. DUNLAP,
N. L. COOLEY,
C. S. WHITMORE,
E. R. OSBAND,
Members of the Board of Health of Lansing Township.

In the article on alleged nuisances, in the Annual Report of this Board for the year 1889, it was mentioned as a noticeable feature of the communications received at this office, during the year 1888, relative to alleged nuisances, that a large proportion of them came from local health officers and other township, city and village officials, asking for information relative to points of law concerning nuisances, or requesting advice as to their duties, or to the proper legal procedure necessary to effect the prevention or abatement of nuisances. The correspondence of 1889, shows an increased desire on the part of local health officials for advice and coöperation of this Board, which has been freely and cheerfully given, and, it is believed, with beneficial results to the public health.

Copies of the revised edition of the compilation of the health laws of the State, including those which relate to nuisances, made by the Secretary of this Board; also of the laws of the State relating to nuisances,—in pamphlet form—may be obtained by those concerned, on application to the Secretary of the State Board of Health.

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED FROM THE USE OF GASOLINE, IN MICHIGAN IN 1889.

At the office of the State Board of Health an effort is made to collect the facts respecting every alleged casualty attributed to the use of gasoline in Michigan. It will be seen, by the following reports received at this office, that there were reported during the year ending December 31, 1889, nine casualties from the use of gasoline in Michigan, in which ten persons were reported to have been burned, one woman being fatally, and two more probably fatally burned. Such details as could be obtained in regard to each casualty are here given.

Fatal Burning of a Woman in Durand, Shiawassee County.

The *Detroit Evening News* of May 21, 1889, gave the following account of the fatal burning of a woman by gasoline, in the village of Durand:

"A signal act of bravery was that of Len Acker, in the fire in the Commercial House at Durand last Friday, when the gasoline in the kitchen took fire and enveloped the room in flames. Acker and three others, two of them women, were in the apartment. Both men escaped unharmed, but Acker returned for the women, and having rescued one, came back for Mrs. Copeland, the other, who had fallen under the table. The room was full of fire, but he pulled his coat over his head and crawled about searching for her until his hand was so badly burned that the flesh fell off in places. It is doubtful if he ever has full use of the member again."

A letter was sent from this office May 24, to Dr. A. G. Cowles, health officer of Durand, from which the following extract is taken:

"I should be glad to hear more concerning the fire and the cause. Will you please write me such facts as you can in regard to it."

The following reply was received from Dr. A. G. Cowles:

"Yours of 24th received, and in reply would say concerning the fire from gasoline. A. M. Acker, dealer in hardware, put a gasoline stove in the kitchen for trial. It was used in the forenoon, and about 2 P. M. he was sent for to come and fill the gasoline stove, there had been a wood fire in the kitchen stove to use in getting dinner, and the gasoline stove, stood close to the side of the wood stove, so that when the rod holding the tank of gasoline was turned over for the purpose of filling, it brought the tank close to the hearth of the wood stove and it is supposed the gas caught from the fire in the wood stove, as there was no explosion other than the igniting of the gas and filling the room with fire.

"The dealer escaped unharmed, the two women could not get out on account of the stifling effect of the burning gas. Mr. Acker immediately returned and assisted one in getting out, and returned for the other, about the time help came with water and threw three pails of water in the room, and happened to throw it upon the woman who was lying upon the floor unconscious. Mr. Acker failed to find her, and continued the search until his left hand was severely burned and he was driven out by the heat. The men who threw the water pushed in and rescued the woman, who, upon being brought to fresh air revived, had her reason and talked until midnight when she died. The burns on the surface were not severe enough to cause death so soon (her hands being the worst), but inhaling the hot poisonous air prevented the lungs from acting after reaction. The two men who saved the lady (Mrs. Copeland) were Mr. Morehouse, and Mr. Simpson. There was no damage to the building other than the room (the kitchen). I treated Mrs. Copeland, and was with her when she died, and have dressed Mr. Acker's hand since that time. In all it was the saddest accident that ever happened in Durand."

Hands and Face Burned by Gasoline in Detroit.

The following was clipped from the *Detroit Journal*, May 11, 1889:

"A gasoline stove exploded at 367 Baker street yesterday afternoon and set fire to the house. Mrs. L. Baby, the occupant of the house, was badly burned about the hands and face in putting out the fire, but no damage was done to the dwelling."

No further report was obtained.

Severe Burning by Gasoline at Grand Rapids.

The Detroit Tribune, July 5, 1889, contained the following:

"Mrs. Johnson A. Dunham, was seriously burned today by an explosion of gasoline. She attempted to fill her stove with the jet burning, and her face, arms and breast were covered with the flaming fluid, and most of her hair burned off."

No official report was obtained.

Gasoline Explosion at Ypsilanti, Washtenaw County.

The Detroit Tribune, of June 21, 1889 contained the following:

"Ypsilanti, June 20. Mrs. Harry Guild, was working about a leaky gasoline stove today when the inflammable liquid caught fire, which soon communicated to her clothing. She ran to a neighbor's, and the prompt application of a blanket smothered the flames. She was considerably burned about the arms and shoulders. A little girl's clothing also caught fire, but her body was not burned."

A Girl Shockingly burned by Gasoline at Miner's Theater, Detroit.

The Detroit Evening News, of October 14, 1889, gave the following:

"The agonizing screams of a woman resounded throughout Miner's theater, at an early hour this morning. Bolliver, the colored footman, who was sitting in front of the house, ran quickly back and a horrible scene presented itself. Ida Scherrer, a young girl, was standing in the middle of the back corridor. She was enveloped in flames, and was wildly swinging her arms about her head. Save me! Save me! she implored, at the same time falling to the floor and rolling over and over in a vain attempt to extinguish the fire. Her dress was nearly burned off, and her hair was singeing. Bolliver stripped his coat off and wrapped it about her, smothering the flames. Her suffering was terrible. She moaned and begged those about to save her from further agony. A coupe was called and she was taken to her home, 194 Chestnut street. She resides at that number with her parents. Dr. Edgar B. Smith was called. He made an examination and found that her hands and arms were frightfully burned, as were also her legs. Her condition is considered by the physician as dangerous. She is only 19 years old and during the present season has been employed about the theater. Shortly before 7 o'clock this morning she went to a closet to draw some water. The place was dark and she lit the gasoline stove. It blazed up and the reservoir ignited. She became frightened and attempted to put out the flames with her hands. Her clothing caught fire, and in her excitement she ran into the hallway.

"An alarm was turned in, but before the department responded the fire was out. The woodwork in the closet was badly scorched."

A Girl Terribly Burned by Gasoline at Sturgis, St. Joseph County.

From the Detroit Tribune, August 13, 1889:

"Mabel Harris, aged 16, was terribly burned while filling a gasoline stove at Sturgis yesterday. She may live."

No official report was received.

Supposed Fatal Burning by Gasoline at East Saginaw.

From the Detroit Evening News, Oct. 10, 1889:

"Mrs. Louis Dall, a widow aged 37, was probably fatally burned this morning by a lot of gasoline, which had been carelessly poured upon the floor of Dr. E. E. Curtis' kitchen at his residence, on the Pendyer farm. The oil ignited by Mrs. Dall stepping on a match. Her clothing was almost burned off, leaving her legs, body, arms and face in a terrible condition. Dr. Curtis was in bed at the time, but hearing her heartrending screams sprang up and threw quilts and blankets around her, extinguishing the flames after burning his hands, legs and night shirt.

"The woman was taken to Saginaw City hospital, where she now lies in a precarious condition."

No official report was received.

Fire at Lansing Caused by Gasoline.

A gasoline stove, at James Christmas', 204 Butler street, caused a fire, Jan. 15, 1889, damage about fifty dollars.

Explosion by Kindling a Fire with Gasoline, at Sault Ste. Marie.

The following to Hon. H. D. Platt, State Inspector of Oils, from the Deputy Oil Inspector, at Sault Ste. Marie, and dated June 28, 1889, explains this case:

"One of our local newspapers reported a kerosene oil explosion recently at 73 Dawson street. I have carefully investigated the report and find as follows: Miss Grace Aberdene, a domestic in the family residing at 73 Dawson street, this city, was on Monday afternoon, June 10, lighting the fire in the cook stove. It not burning quite brisk enough to suit her, she took the *gasoline* can and poured the fluid on the fire. The result was an explosion, throwing some of the fluid on her clothing which took fire and burned her right hand, arm and shoulder very badly. She is at this writing nearly recovered. The explosion did no other damage than burning the young lady and destroying some of her clothing.

Hands and Face Frightfully Burned by a Gasoline Torch in Alpena, Alpena County.

The following clipping from an Alpena local paper was received from Hon. H. D. Platt, State Inspector of Oils, together with a letter from W. E. Rogers, Deputy Oil Inspector at Alpena:

"Joseph Haines, a plumber who works for W. H. Campbell, met with a serious accident last Thursday. While at work, he was using a hand gasoline torch; it exploded, and he was frightfully burned about the face and hands. He was placed in charge of Dr. Howell, and is recovering as well as can be expected under the circumstances. His eyesight is not injured. The burning oil was blown on his face, hands and clothes, and presented a horrible sight with the flames streaming from him. Assistance was promptly rendered, and the fire about him smothered out. A great deal of the outer skin was burned off his hand."

List of Casualties consequent on the use of Gasoline in Detroit, Calendar year 1889.
(Supplied by William H. Baxter, Fire Marshal, in Detroit.)

Date.	Street and No.	Nature of Casualty.	Amount of damage.
1889.			
Jan. 21	223 Jefferson	Overflowing stove	
Feb. 13	166 Woodward	Overflowing stove	
Mar. 10	367 Baker	Overflowing stove	
Mar. 11	11 Columbia E.	Overflowing stove	
June 6	134 Larned E.	Lamp overflowed	
July 12	267 Jefferson	Leaking stove	
Aug. 28	960 Champlain	Burner of stove left open, letting gasoline flow out	
Aug. 31	480 Forest W.	Explosion of stove	$77.00
Sept. 9	49 Madison	Stove overflowed	
Sept. 17	60 High W.	Overflowing stove	
Oct. 14	179 Randolph	Overflowing stove	5.00
Oct. 19	162 Michigan	Overflowing stove	5.00

List of Casualties consequent on the use of Naphtha, in Detroit, Calendar year, 1889.
(Supplied by William H. Baxter, Fire Marshal in Detroit.)

Date.	Street and No.	Nature of Casualty.	Amount of damage.
1889.			
March 24	38 Maple	Escaping gas ignited in cellar of brewery. Naphtha used for cooling purposes	$376.00
April 4	364 Grand River	Gas from "None Such" stove polish ignited from fire in stove	412.00
June 17	R. R. Freight car	Vapor ignited from brakeman's lamp	

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED BY ILLUMINATING OILS IN MICHIGAN, DURING THE YEAR 1889.

At the office of the State Board of Health care is taken to collect the facts respecting every casualty or accident alleged to be due to illumiating oil, in Michigan. Besides watching for newspaper reports throughout the year, and the reports by the several deputy inspectors of illuminating oils, at the close of the year, the health officer of each township, city and village, is asked to report in his annual report, every casualty due to illuminating oil.

During the year ending December 31, 1889, 53 accidents were reported to or came to the notice of the office of the State Board of Health, eight persons having been fatally burned.

Of the 53 casualties which occurred, sixteen contain positive evidence of the actual explosion of a lamp containing kerosene oil.

The details, as far as could be ascertained, are given in connection with each locality. A list of casualties is supplied by William H. Baxter, Fire Marshal of Detroit.

A summary relative to the "Flashing point" of the oil alleged to have caused the explosions, fires and injuries in six instances, according to tests made after the fires or injuries, is as follows:

Lamp explosion in the village of Coral, January, 1889:
"The thermometer registering 122 degrees when the flash occurred."
F. A. BALDWIN, *Dept. Oil Inspector.*

Fire in the city of Detroit, Jan. 15, 1889:
"Going as high as 122 degrees before flashing."
"ROBERT PELHAN, JR., *Dept. Oil Inspector.*"

Fire at Sault St. Marie, Jan 29, 1889:
"Oil same as that from which the lamp was filled, flashed at 123 degrees."
"C. H. CHAPMAN, *Dept. Oil Inspector.*"

Lamp explosion in the Metropolitan Hotel, Manistee, May 6, 1889:
"It stood 128 degrees."
"LEANDER WEAVER, *Dept. Oil Inspector.*"

Fire in the village of Lake Odessa, Sept. 6, 1889:
"Flashed at 123 degrees. Fire originated in part of house where a kerosene lamp had been left burning, but nothing is known as to whether or not the lamp caused the fire."
"E. T. YEOMAN, *Dept. Oil Inspector.*"

Explosion of lantern in the township of Irving, Oct. 26, 1889:
"It vaporized at 123 degrees F."
"A. D. BANK, *Dept. Oil Inspector.*"

Supposed Lamp Explosion at Coral, Montcalm County.

On January 8, F. A. Baldwin, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, as follows:

"DEAR SIR:—Permit me to report the following (supposed) lamp explosion which occurred at the residence of M. A. Boomer, in this village. The circumstances as near as I can obtain them are substantially as follows: The lamp (an ordinary table lamp) had been filled that evening, and had been burning only about half an hour and was therefore nearly full.

"The family were seated at the table, when without any perceptible cause, the lamp exploded. The oil did not take fire, though the wick continued to burn until blown out by the party who picked it up.

"I procured a sample of the oil from which the lamp was filled, and gave the same a careful test, and found it well up to the required standard. The thermometer registering 122° when the flash occurred. I forward the burner, which seems to be the same kind as those commonly in use here and is nearly new.

"I cannot account for this occurrence, and should be pleased t have you acquaint me of the result of your investigation. Should you require any further information concerning this matter, will gladly furnish it (if possible)."

Fatal Burning of a Woman at Cassopolis, Cass County.

The *Detroit Tribune* of January 18, 1889, contained the following item:

"Cassopolis, Jan. 17. Mrs. George Martin, the young and handsome wife of an engineer at Hopkins' flouring mills, was preparing supper last night by the light of a kerosene lamp, which was standing on a rickety table near the stove. In moving about she carelessly struck against the table, overturning the lamp, which rolled to the floor and broke.

"Mrs. Martin's clothes were saturated with burning oil in an instant, and after frantically endeavoring to subdue the flames she fled screaming to the street. Neighbors soon rushed to the agonized woman's assistance, and wrapping her in blankets put out the fire and called a physician. Her sufferings were frightful to witness, the flesh of almost her entire body being cooked. She died before midnight."

On Jan. 28, D. G. Sharp, M. D., wrote a letter to State Oil Inspector, Hon. H. D. Platt, which was kindly furnished this office by the latter official, from which the following extracts are taken:

"In removing the table-cloth, she knocked the chimney from the lamp and in making a quick movement to arrest its fall, she in turn capsized the lamp, which caused it to break. The fire on the wick lighted the kerosene from whence her clothing was ignited. She tried to smother the flames with a quilt and water, but this was only accomplished when some neighbors came to her assistance. At this time some fragments only of clothing remained on her person. Perhaps not over a square foot of her body remained unharmed. She was alone at the time of the accident and from her intense suffering could give but a vague idea of what transpired. The house was but little damaged.

"The dealers here say their kerosene has all stood the Michigan test. I do not think any fault can be attached to the oil."

Fatal Burning of a Child in Detroit.

The *Detroit Tribune*, January 22, 1889, contained the following item:

"Frederick Abraham, 358 Wilkins street, lighted the sitting room lamp last Saturday night about 6 o'clock and hung it up as usual on a hook used for that purpose. Shortly afterward the hook broke and the lamp came down with a crash, breaking into several pieces and setting fire to the oil, which was spilled on the floor and over the clothing of Abraham's 3-year-old daughter, Rosa. Before the flames could be extinguished the girl was horribly burned about the head, face, hands and breast. Dr. Schulte, who was called in, did all he could to alleviate the sufferings of the girl, but his efforts proved futile, and the unfortunate child died Sunday night after about twenty-four hours of terrible agony. As it was clearly an accident no inquest will be held."

Fire Caused by a Defective Burner, at Detroit.

Concerning this fire Robert Pelhan, Jr., Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, Jan. 25, as follows:

"DEAR SIR:—In the matter of the 'lamp explosion' reported in the *Evening Journal* of Jan. 16 (not 17), to have taken place at 387 Hastings street, Jan. 15 (not 16), I find upon careful investigation that there is no evidence that the lamp did explode, but rather that it caught fire from a defective burner.

"The inmates of the house all testified that upon several previous occasions the lamp or burner had been seen to splutter, catch fire and communicate the same to the oil in the lamp, and gave it as their opinion that this was undoubtedly the cause of the lamp setting fire to the house.

"The oil was bought at a corner grocery from a supply furnished by one of Bently's tank wagons, and was found to stand the test, going as high as 122° before flashing.

"I made an effort to get the burner spoken of but it had been thrown away.

"The daily papers here all use the phrase 'lamp explosion' in speaking of such fires, even in cases where the lamp is overturned, dropped, or carelessly handled, and in so doing save space. I spoke to Mr. Bower, city editor of the *Journal*, about this some months ago, and he replied, 'Oh! you oil inspectors are too sensitive about such things.'"

Accident from the use of Kerosene at Sault Ste. Marie.

Deputy Oil Inspector C. H. Chapman wrote to Hon. H. D. Platt, State Oil Inspector, on January 28, substantially as follows:

Mrs. Ashman let a lamp fall. Lamp was broken, and the oil spilt on a hot stove and ignited, flames were extinguished without any particular damage being done.

Alleged Lamp Explosion at Sault Ste. Marie.

On February 11, Deputy Oil Inspector C. H. Chapman wrote to Hon. H. D. Platt, State Oil Inspector, substantially as follows:

Tuesday night, January 29, last, an accident occurred in the American Hotel from a lamp. It was not known whether the lamp exploded or fell from the table, on which it was left burning. Amount of damage done, probably twenty dollars. Oil same as that from which the lamp was filled flashed at 123°. It was water white oil and came from the Standard Oil Co.

Fatal Burning of a Woman in Lapeer.

The *Detroit Tribune* of March 7, 1889, contained the following item:

"Mrs. William Charity was carrying a lighted lamp at an early hour this morning when it exploded without warning. She was covered with burning oil in a instant. She ran shrieking to her husband, who with great presence of mind seized a blanket off from a bed and completely enveloped her, smothering the flames.

"A physician was at once called and the agony which the unfortunate woman was suffering relieved as much as possible. She was terribly burned and now lies in a very critical condition."

Of the death of Mrs. Charity of Lapeer, Geo. H. Turner, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, as follows:

"On last Tuesday morning March 5, Mrs. Phebe Ann Charity, of Lapeer, a colored woman living in my district met with a kerosene explosion which caused her death. I found on examination she set her lamp on the stove hearth when she was getting supper, and while she had a strong fire, until the oil was sufficiently heated to cause gas to accumulate, and while in that condition the lamp was removed by her husband who had just come in the house. As he touched the lamp it exploded. The fluid flew on her and immediately commenced to burn. And before the flames could be put out her limbs and body were so badly burned she died within two days.

"I interviewed the attendant physician, Dr. Jackson. He inspected the oil, found it emitted a vapor at 176°,* pronounced it good. He said Mrs. Charity, was at the time under the influence of liquor. Both herself and husband are in the habit of drinking. Mr. Charity thought no blame could be attached to the authorities. I would have inspected some of the oil but none could be obtained. He had the oil mixed. The people are quite poor."

Fire at Detroit, March 22, 1889.

The following is a copy of a letter from William H. Baxter, Fire Marshal in Detroit:

DEAR SIR:—The fire at 34 Cadillac square, referred to in your favor of yesterday, originated in about this manner: It was a grocery establishment, and kerosene oil was kept in a tank, with a line of pipe attached to it. Plumbers repaired, as they supposed a leak in the pipe, the leak continued and the oil communicated with a light in the basement.

Accident Caused from Kerosene Oil at Sebewa, Ionia Co.

The *Detroit Evening News* of April 8. 1889, gave an account of the burning of a woman in Sebewa, as follows:

"Mrs. Ann Sargent, of Sebewa, met with a terrible accident Friday. She was alone in the house working near a stove when her apron, which was saturated with kerosene, ignited. Her son rushed to her rescue, and with a shawl tried to smother the flames, but the shawl was also ignited, and she was terribly burned about the face and breast. She is nearly blind and cannot recover."

*This test was not with the legal tester, but with an open tester, and the lighted match held an inch above the surface of the oil.

Nothing further could be learned.

Lamp Explosion at Clare, Clare Co.

The *Detroit Evening News*, May 13, gave the following:

"A lamp filled with oil, not burning, exploded in the parlor of Prof. Wood's residence in Clare one night last week. As the lamp had not been used for five days the professor is naturally anxious to know what kind of oil it was filled with."

Lamp Explosion at Manistee, Manistee Co.

Of this explosion, Leander Weaver, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, as follows:

"There was an explosion at the Metropoliton Hotel in this city May 6. I took the oil that was left in the lamp, and tested it, and it stands the test. It stood 123°, with the most careful test I could possibly give it. The lamp was a glass fount, with one of these electric burners. The lamp was nearly full of oil at the time. There was a hole in one side as you often see a chimney break. I will give you a diagram of the lamp, and get the burner and send it to you by mail. There was a considerable wind blowing at the time. The lamp was in the draft. The facts as near as I am able to ascertain as to the cause are these: (In the first place those burners are designed for metal founts). The fount being glass the blaze being so large creating a large volume of heat, heating the glass so hot where no oil touched it a cold draft of air striking the glass burst the glass fount, similar as it will break a chimney, for the oil was all in the lamp below the break, no damage was done."

Alleged Lamp Explosion at Cedar Springs, Kent County.

The *Detroit Evening News*, July 25, 1889, contained the following item:

"This morning fire destroyed the new residence of Dr. C. S. Ford. Scarcely any of the contents were saved. Loss, $5,000; insurance, $4,000. It is thought to have originated from a lamp explosion."

July 31, Benj. C. Porter, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, substantially as follows:

"Dr. Ford's house at Cedar Springs, Kent county, was consumed by fire. It was thought to have originated from a lamp exploding, but on investigation found nothing positively known as to cause. Dr. Ford said 'there was a lamp burning at the time; an ordinary glass lamp such as in general use;' but he could not say whether the fire started in the room where the lamp was or not. He said that he did not think it originated from a lamp explosion. Nothing like an explosion was heard by any one."

Fire from Overturned Lamp, at Mt. Morris, Genesee County.

The *Detroit Tribune*, August 17, gave the following:

"Late last night the house of Aberdeen McGregor of Mt. Morris caught fire from an exploded lamp. The flames did their work so rapidly that they could not be extinguished, although prompt efforts were made. Mr. McGregor was severely burned in his efforts to save his three sleeping children. He was successful. The house and contents were entirely destroyed. There is insurance to the amount of $150 in the Ohio Farmers' Co., but the loss is fully eight hundred dollars."

The following is a letter from Deputy Inspector George H. Turner, of Flint, to Hon. H. D. Platt, State Oil Inspector:

"Mrs. McGregor was ironing, and accidentally knocked the lamp from the table, after which the fluid caught on fire. The clothes burned up, and before he or she could smother out the flames the house was on fire, and all consumed, with the contents. There was no explosion. Both Mr. and Mrs. McGregor were slightly burned the hair singed in front. A small insurance on the house and contents. The oil was proof (Ingalls)."

Fire Caused by Overturning and Breaking of a Lamp, at Detroit.

The *Detroit Tribune* of August 15, 1889, contained the following item:

"About 8:50 o'clock last evening pedestrians in the neighborhood of the Hotel Cadillac were thrown into fever of excitement by seeing several fire engines dash up to the corner of Michigan and Washington avenues. Following the engines an immense crowd gathered about Howard Pinkerton's confectionery store, 82 Michigan avenue, from the basement of which issued a dense volume of black smoke. To add to the excitement, it was rumored that Mr. Pinkerton had been hemmed in by the fire and suffocated by the smoke. The police with great difficulty cleared a space for the firemen to work in. Mr. Pinkerton turned up all right, and the fire, caused by the explosion of a lamp carried into the cellar by one of the girls employed in the store, was extinguished after doing about two hundred dollars' worth of damage."

The following is a copy of a letter to the State Oil Inspector, from Deputy Inspector Robert Y. Ogg, dated August 26:

"DEAR SIR:—Received your letter about half an hour ago, and have investigated the explosion at Howard Pinkerton's, corner of Washington and Michigan avenues.

"Pinkerton keeps a confectionery, and in the basement were boxes, paper packages and other light and inflammable stuff. One of his lady clerks went into the basement, taking a lamp with her, and setting it on a box accidentally caught her dress on a nail in the corner of the box dashing the lamp to the floor, breaking it, causing everything around it to catch fire. Damage about $200; insured."

House Burned at Lake Odessa, Ionia County.

The *Detroit Evening News*, September 6, 1889, gave the following:

"W. H. Mann's residence burned to the ground this morning at 3 o'clock. Mrs. Mann was alone in the house with a lamp burning beside the bed, which exploded. The furniture was saved. There was some insurance on the house."

E. T. Yeoman, Deputy Oil Inspector, wrote to Hon. H. D. Platt, State Oil Inspector, on September 14, substantially as follows:

"Fire originated in part of house where kerosene lamp had been left burning, but nothing was known as to whether or not the lamp caused the fire. Cahoon and Bros. are the firm who sold the kerosene that Mrs. Mann was using at the time of the fire. I have tested a sample of it and flashed it at 123°."

Fatal Burning of a Young Woman at Pontiac, Oakland Co.

Of the death of this young woman, Mason W. Gray, M. D., health officer of Pontiac, reported as follows:

"The particulars of the death, by burning, of Miss Sarah Foot, are as follows: Miss Foot was alone in the house, and while trimming and filling a kerosene lamp, her dress caught fire in some way, she could not explain during the few hours she lived after the accident happened. When she discovered her clothing was on fire, she rushed out of doors, was seen by a teamster who chanced to be passing and by a man who was in the cemetery opposite her home. These men at once ran to her assistance, but before they could put out the fire she was burned severely over a great part of the body. She lived about six hours after.

"Perhaps I should add that Miss Foot had lighted the lamp to see if the trimming had been properly done, and her family suppose that her dress caught fire from the match which she had failed to extinguish after lighting the lamp."

Fire at Detroit, December 1, 1889.

Of this fire, William H. Baxter, Fire Marshal in Detroit, wrote to this Office as follows:

"Somewhere in the report sent you, you will find a very heavy loss—some $40,000—the cause for which may be enigmatical; the fire was at the house of ex-Mayor Wm. G. Thompson on Jefferson Ave. He pur-

chased the first "Grand Oil Heater" put on the market here, to heat his conservatory; the person i charge took the top off the stove and put in its place a tin pan containing water, thus effectually shutting off all escape for smoke, heat, etc. In consequence there was nothing left but for the internal arrangement to be burned out. This let the blazing oil on the floor—about two gallons—and the fire spread so rapidly that the occupants barely escaped suffocation. From this you will perceive that the casualty was not the result of the grade of the oil used, but the stupidity of the person who arranged the stove."

Explosion of a Lantern in the Township of Irving, Barry County.

A. D. Bank, Deputy Oil Inspector, reported to Hon. H. D. Platt, State Oil Inspector, as follows:

"In compliance with your request the undersigned, your deputy, on Dec. 25, 1889, visited the farm of Isaac S. Taylor, on section 30, in the township of Irving, Barry Co., for the purpose of investigating the cause of an explosion of a kerosene lantern on the morning of Oct. 26, 1889, which resulted in burning two barns and contents valued at $2,800 to $3,000.

"Your deputy was informed by the wife of Isaac S. Taylor, that on the 25th of October her husband purchased a gallon of kerosene oil at the store of B. A. Almy, in Middleville, from which she filled a lantern, which was empty, and two lamps which were partly empty. On that evening the lamps were lighted during the evening; the lantern also was lighted during about ten minutes that evening.

"The next morning at about 5 o'clock about fifteen minutes after the lantern had been lighted, and while Mr. Taylor was putting oats in the manger twenty feet or more away from the lantern which was standing on a wagon in the barn, the explosion occurred. Mr. Taylor fell into the manger and by the time he was on his feet again the fire was flaming all through the barn.

"In answer to the question what was done with the oil after the fire, she said: 'I emptied the can and the lamps into a jug and put the jug under the corn-crib.' She then proceeded to produce the jug, remarking as she brought it, that it must have been tipped over for it was nearly empty. In answer to the question, did you find it tipped over? she replied, no, sir; but when I put it there it was two-thirds full.

"The jug was a gallon fruit jug requiring a two inch stopper. The stopper was of wood flat on one side, a piece of cloth around it, loose fitting, only an excuse for a stopper.

"Your deputy put the contents into a bottle and upon applying his nose to the jug thought he recognized the odor of gasoline.

"Your deputy also met one Henry Goodspeed, a man who was milking cows about fifteen rods from the barn at the time the explosion occurred and was told by him that he heard the report of the explosion which sounded like the report caused by firing a gun, that he ran to the barn immediately and found it all ablaze inside.

"Your deputy visited the store where the kerosene oil was bought and found that oil was kept in the store and that gasoline was kept in a building for the purpose, adjacent to the store. Mr. Almy, stated that he had no recollection of selling oil or gasoline to Isaac S. Taylor but if he called for kerosene that was what he let him have.

"There was about a gill of oil in the jug which your deputy gave to the State Chemist, R. C. Kedzie, who reported that it was kerosene oil and that it vaporized at 123° F."

Accident from a Lamp at Alpena, Alpena Co.

Below is given a copy of a letter from deputy inspector W. E. Rogers, to State Inspector Hon. H. D. Platt, Jan. 24, 1890:

"Some four weeks ago there was an accident from a lamp. A lamp was sitting on a small center table with strings and ribbons, etc., hanging from the table. A cat was playing with these strings, and pulled the lamp over on the floor, but it was soon extinguished. Carelessness was the cause of this."

List of Casualties Consequent on the use of Kerosene, in Detroit. Calendar Year, 1889.
(Supplied by William H. Baxter, Fire Marshal in Detroit.)

Date.	Street and No.	Nature of Casualty.	Am't of Damage.
Jan. 22	200 Macomb	Lamp exploded	$128 00
Jan. 25	96 Adams east	Lamp upset	19 00
Feb. 19	244 Chene	Lamp held against clothes	105 00
Feb. 26	18 Fort west	Lamp upset	
Mar. 4	233 Jefferson	Starting fire in stove	
Mar. 5	85 Gratiot	Blazing lamp	
Mar. 22	34 Cadillac Square	Leak in pipe	2,600 90
Apr. 17	70 Adams east	Lamp exploded	23 00
Apr. 21	43 Cadillac Square	Lamp fell from bracket; three lives lost	2,378 00
Apr. 25	23 Monroe	Lamp dropped on floor	55 00
June 1	442 Milwaukee east	Lighted lamp held too near clothing	
June 11	370 Orleans	Lamp held against clothing	160 00
June 11	421 Thirteenth	Accidental falling of lamp	170 00
June 28	102 Gratiot	Lamp exploded	15 00
July 5	477 Grand River	Lamp exploded	2,080 00
Aug. 5	126 Brewster	Lamp exploded	25 00
Aug. 14	82 Michigan	Lamp exploded	496 00
Aug. 28	56 Williams	Stove fell over	
Sept. 7	261 Gratiot	Stove accidentally upset	785 00
Sept. 10	298 Seventh	Lamp exploded	111 00
Sept. 12	82 Brady	Lamp exploded	816 00
Sept. 18	102 Mullett	Careless use of lamp	271 00
Nov. 2	91 High east	Lamp exploded	1,728 09
Nov. 4	1238-1240 Second	Lamp exploded	7,000 00
Nov. 7	431 Champlain	Lamp knocked off table	
Nov. 11	205 Wight	Lamp upset	
Nov. 12	338 Dubois	Lamp exploded	8 00
Nov. 14	341-3-5 Trumbull	Falling of lamp	1,420 00
Nov. 25	914 Chene	Lamp exploded	1,450 00
Dec. 1	678 Jefferson	"Grand Oil Heater" stove exploded	40,000 00
Dec. 5	Foot of Columbus av.	Lamp on steam barge William Young fell on floor of cabin	2,650 00
Dec. —	119 Columbia east	Lamp tipped over	209 00
Dec. 10	201 Wight	Lamp too close to ceiling; heat from chimney set fire to wooden ceiling	
Dec. 17	143 High west	Stove exploded	67 00
Dec. 31	768 Russel	Lamp exploded	480 00

Respectfully submitted,
HENRY B. BAKER,
Secretary.

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ERRATA.

Page lxvii, third from last line in right-hand column, for Kafter read Rafter.

Page 10, in Exhibit 1, for D. H. Pelton read D. A. Pelton.

Page 102, third nonpareil line in Exhibit V, for Dagget read Daggett.

Page 103, in Exhibit VI (line 28), for Wessenger read Wessinger.

Page 134, in second line of heading to Exhibit XIII, for eleven read twelve.

Page 145, in second line of heading to Exhibit XX, for eleven read twelve.

Page 165, in eleventh line in nonpareil type, for L. R. Houghton read L. A. Houghton.

Page 184, near end fifteenth line, for ont read out.

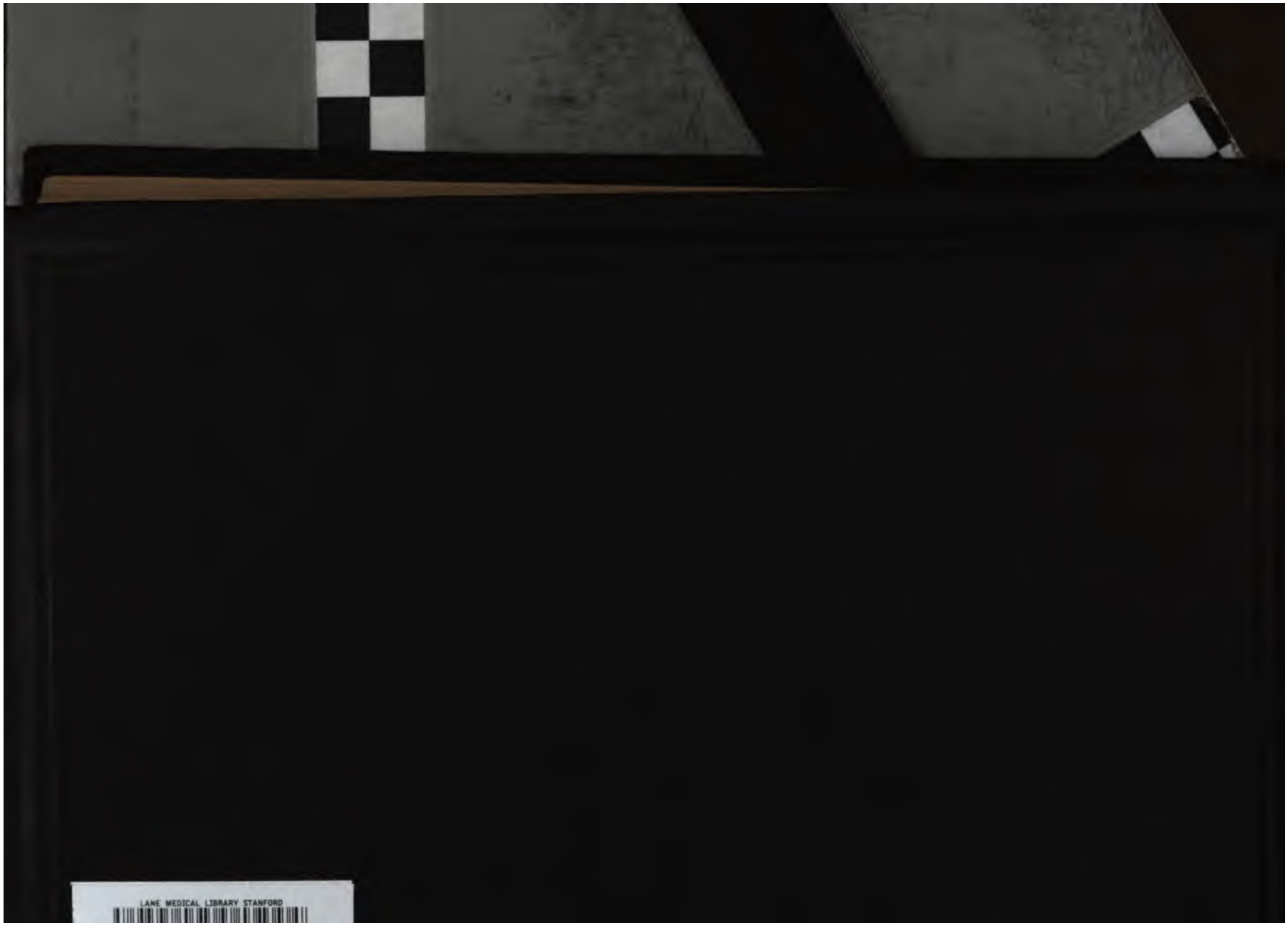
Page 212, in second line nonpareil type, for Prairie Rond read Prairie Ronde.

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